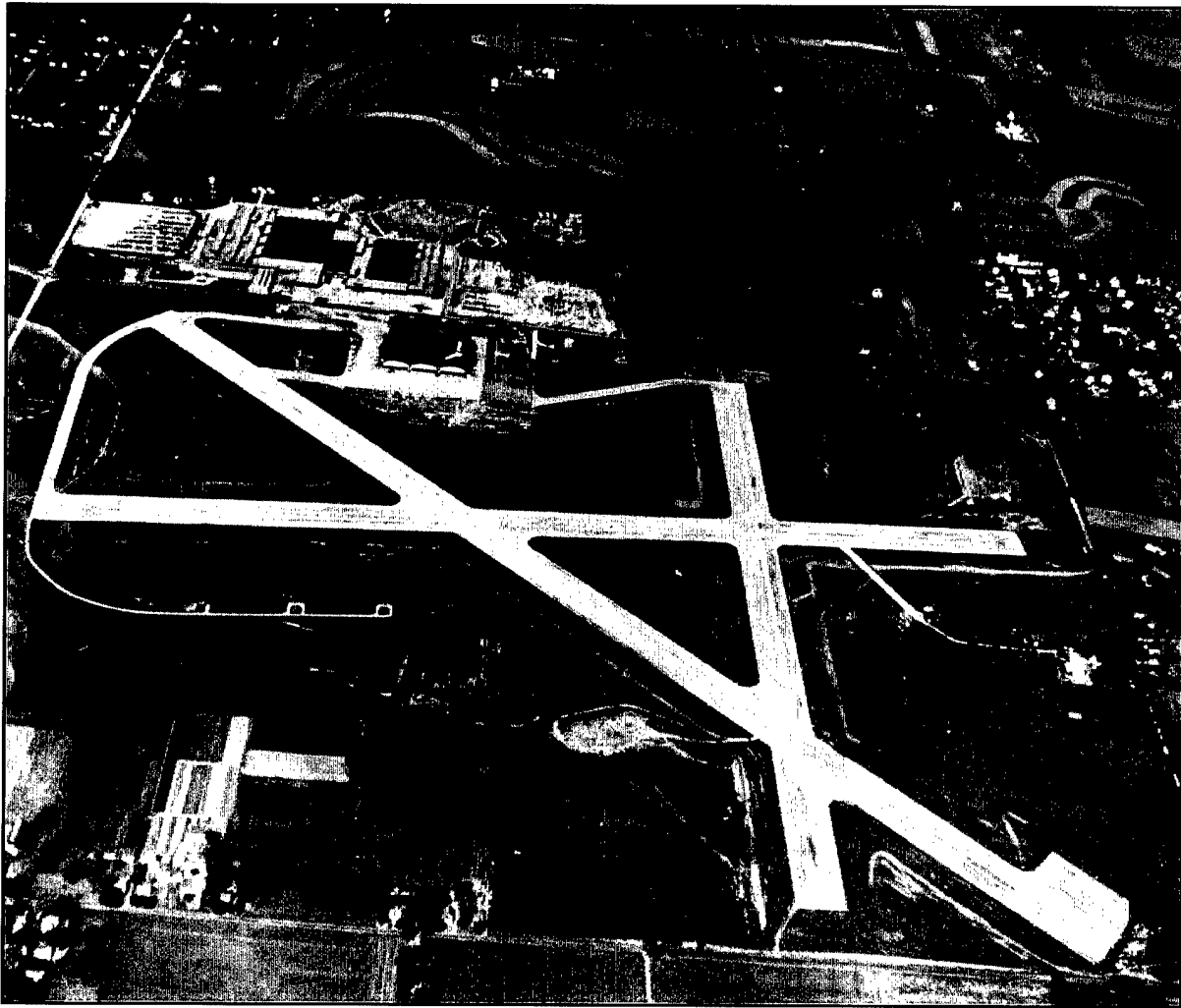


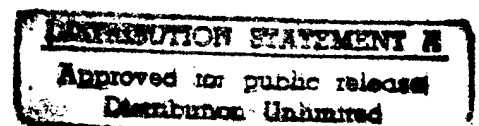
DRAFT ENVIRONMENTAL IMPACT STATEMENT



DISPOSAL AND REUSE NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION WARMINSTER, PENNSYLVANIA



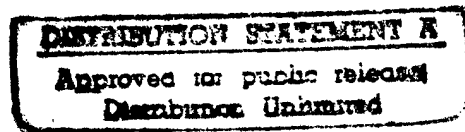
Department of the Navy
December 1996



Prepared for
Department of the Navy
Northern Division
Naval Facilities Engineering Command

in accordance with
Chief of Naval Operations Instruction 5090.1B

pursuant to
National Environmental
Policy Act Section 102(2)(C)



Draft Environmental Impact Statement

Disposal and Reuse of Naval Air Warfare Center Aircraft Division Warminster, Pennsylvania

December 1996

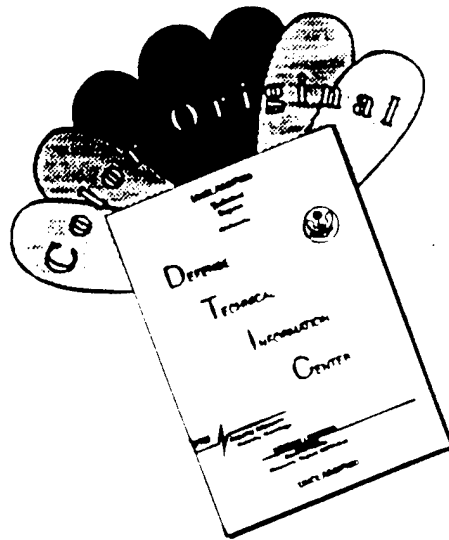
Please contact the following person
with comments and questions:

19970109 029

Kurt C. Frederick
Phone: (610) 595-0728
Fax: (610) 595-0778
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway
Lester, PA 19113

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DEPARTMENT OF THE NAVY

NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO

11010

January 3, 1997

TO: ALL INTERESTED OFFICIALS, GOVERNMENT AGENCIES, SPECIAL
INTEREST GROUPS, AND CONCERNED INDIVIDUALS

Attached for your review is the Draft Environmental Impact Statement (DEIS) for the Disposal and Reuse of the Naval Air Warfare Center, Aircraft Division (NAWCAD), Warminster, Pennsylvania. The DEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality Regulations implementing NEPA (40 CFR 1500-1508) and the Chief of Naval Operations Instruction OPNAVINST 5090.1B. The DEIS addresses the environmental consequences of the proposed Community Reuse Plan for the NAWCAD as prepared by the Bucks County Economic Adjustment Committee and Base Reuse Subcommittee (now known as the Federal Lands Reuse Authority of Bucks County) in March of 1995.

The Department of the Navy will hold a public hearing to inform the public of the DEIS findings and to solicit comments. The hearing will be held on Tuesday, January 28, 1997, beginning at 7:30 p.m., at the Warminster Township Building, Henry and Gibson Avenues, Warminster, Pennsylvania. Please call the point of contact below or the Township Building in the case of inclement weather.

Federal, state and local agencies and interested parties are invited and urged to attend or be represented at the hearing. Oral statements will be heard and transcribed by a stenographer; however, to assure the accuracy of the record, all statements should be submitted in writing. All statements, both oral and written, will become part of the public record on this action and will be given equal consideration.

Additional copies of the DEIS have been placed in the Warminster Library, 1076 Emma lane, Warminster and the Bucks County Library, 150 South Pine Street, Doylestown.

Written comments on the DEIS should be mailed to the address noted below and must be postmarked not later than February 24, 1997 to be part of the official record.

January 3, 1997

page 2

This public hearing and comment period shall also serve as an opportunity for members of the public to express their views on the effect of the proposed Reuse Plan on the property.

Additional information may be obtained by contacting Mr. Kurt Frederick (Code 202) Northern Division, Naval Facilities Engineering Command, 10 Industrial Highway, MSC 82, Lester PA 19113, telephone 610-595-0728, facsimile (610) 595-0778.



Robert K. Ostermueller
Head, Environmental Planning
By direction of the
Commanding Officer

EXECUTIVE SUMMARY

S.1 Purpose and Need

As directed by the Defense Base Closure and Realignment Act (BRAC) and implemented by the 1991 and 1995 BRAC process, the Navy plans to close and dispose of the Naval Air Warfare Center Aircraft Division (NAWCAD) Warminster, located in Bucks County, Pennsylvania, approximately 18 miles (mi) (29 kilometers [km]) north of Center City Philadelphia. This facility has been the principal Navy research, development, test, and evaluation center for naval aircraft systems and airborne and antisubmarine warfare systems.

Because BRAC II provided specific direction regarding the relationship between the property disposal process and National Environmental Policy Act (NEPA) requirements, this Environmental Impact Statement (EIS) has been prepared to address the probable impacts of the disposal and reuse of NAWCAD, and thereby to fulfill requirements for NEPA compliance.

The Base Closure and Realignment Commission determined in 1991 that NAWCAD would be slated for a major realignment. The majority of the aircraft systems Research, Development, Test, and Evaluation (RDT&E) would be relocated to the Naval Air Warfare Center Aircraft Division Patuxent River, Maryland. A few specialized, immovable facilities would remain at NAWCAD. The dynamic flight simulator and the RDT&E Division would remain, and the Oreland Open Water Facility would remain government property under NAWCAD Patuxent River. Military family housing would be retained. All other tenant commands would be disestablished or relocated off the site.

Subsequently, in 1995, the Commission recommended that several NAWCAD facilities designated to be retained by the Navy should, in fact, be closed and disposed of: the inertial laboratory (Bldg 108); the dynamic flight simulator buildings (Bldgs 70 and 72); and extensions of the main complex of buildings (Bldgs 125 and 138). The military family housing would be retained and transferred to the Naval Air Station Joint Reserve Basin Willow Grove (NASJRBWG).

The Navy, acting as the disposal agency for NAWCAD, has completed its formal procedures for disposal of the property. These include offering the property to other Department of Defense (DoD) agencies and the Coast Guard and then to other federal agencies; advertising the property for use by agencies serving the homeless, either under the Stewart B. McKinney Assistance Act of 1987 or the Base Closure Community Redevelopment and Homeless Assistance Act of 1994 (PL 103-421); offering the property, next, for sale to state and local government bodies and governments of Indian tribes; and finally, if no interest has been generated, offering the property for sale to the general public by competitive bid or auction.

No other DoD or federal agency expressed any interest in NAWCAD; therefore the properties have been declared surplus to DoD. Bucks County has applied for consideration under the provisions of the Base Closure Community Redevelopment and Homeless Assistance Act of 1994 (the Pryor Amendment) for conveyance of the property. The Reuse Plan (ERA, 1995) cites nine proposals, three of which have received Federal Lands Reuse Authority (FLRA) Board approval and are slated for review by the Department of Housing and Urban Development (HUD).

Additionally, the Navy is working with Bucks County on reuse of NAWCAD property that may be acquired by the county and converted to the uses proposed in the county's *Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania* (March 1995), which was prepared by the Bucks County Economic Adjustment Committee and Base Reuse Subcommittee (now known as the FLRA), March 1995. The proposed Reuse Plan and its alternatives are the subject of this EIS.

Public input has been solicited via a public scoping meeting held in October 1995 to identify significant issues that had to be addressed in the EIS. Concern centered on cleanup of contaminated sites on and around NAWCAD, provision of ample recreation space under reuse, and impact of future NAWCAD reuse on stormwater in adjacent areas.

S.2 Description of the Proposed Action and Alternatives

Section 1502.14 of the Council on Environmental Quality (CEQ) regulations refers to the analysis of alternatives as the "heart of an EIS," reflecting the importance of providing both the decision-maker and the public with "sharply defined issues and a clear basis for choice among options." CEQ regulations direct that reasonable alternatives to the proposed action must be evaluated in an EIS, even if these alternatives are not within jurisdiction of the agency. This EIS, therefore, considers three action alternatives.

The proposed action is the disposal and reuse of NAWCAD pursuant to the proposed *Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania* (March 1995), prepared by the FLRA. The FLRA was established in early 1995 to implement the Reuse Plan. It is empowered to carry out the business of redeveloping NAWCAD, including management, leasing, property improvements, and future planning.

Two other reasonable alternatives are also considered in this EIS: the Residential Alternative and the Aviation Alternative (although neither alternative presently has a sponsor). The proposed Reuse Plan and its alternatives represent three levels of development intensities and resulting impacts (i.e., the Residential Alternative being low; the Reuse Plan being medium, and the Aviation Alternative representing the highest intensity) that might occur with disposal and reuse of NAWCAD property.

This EIS also addresses the no action alternative. This alternative is presented and developed as the future baseline condition against which the impacts of the proposed action and its alternatives are measured.

S.2.1 Reuse Plan - The Preferred Alternative

Planning for the disposal and reuse of NAWCAD, recently the principal Navy RDT&E center for both naval aircraft systems and airborne and anti-submarine warfare systems, began with a community involvement effort that identified concerns and led to the establishment of goals and objectives primarily aimed at alleviating potential economic losses upon closure of the facility. In screening potential reuses, the FLRA noted NAWCAD's assets: location (a major multi-acre facility in a growth area), presence of an airfield and supporting facilities, resident highly skilled workers, and facilities that lend themselves to a campus-style environment.

While several constraints were also noted (the age and design of some buildings, access limitations, cost of runway removal, residential location, and potential actual or perceived environmental problems), the FLRA found that office, industrial, recreational, and residential uses were all potentially appropriate, and identified at least 15 specific reuse ideas, of which a university branch campus proved to be the most popular.

The reuse consultant team examined all potential reuse options in terms of the market and economic base, existing NAWCAD facilities, and site conditions; developed a series of mapped land use scenarios; and prepared rankings for each alternative with respect to jobs created, tax revenues, fiscal considerations, open space, and recreational opportunities, environmental impacts, potential for early action and successes, infrastructure requirements, and implementation.

The decision by the FLRA to retain the main buildings at NAWCAD was key to the development of two preliminary reuse scenarios. This decision was closely tied to strong interest expressed by several universities, a medical school, and potential technology tenants to implement a multi-business complex within the space. The two scenarios were developed to reflect a mix of the activities proposed by the community, that were responsive to market demand, and that were built on sound planning principles. Each was anchored on a multi-business complex, university, and medical adaptive reuse concept that involved Bldgs 1, 2, and 3 and the surrounding land, and included such other suggested components as congregate housing, small hotel and conference site, golf-residential development, and parks and open space.

The two options were compared using a variety of factors, including the potential fiscal advantages of public benefit conveyances. The Reuse Plan ultimately adopted by the Bucks County Commissioners in March 1995 was officially delivered to the Navy in April of that year. Its design capitalizes on the site's assets and minimizes the constraints. It focuses more intensive uses where

major transportation and other infrastructure exists, and puts less intensive land uses, including additional parkland, to the east near existing residential areas and parklands.

The building blocks of this Reuse Plan are the multi-business complex use of the Bldg 1, 2, 3 complex; a new industrial/business/office R&D complex; major new spine road; park and recreation uses; university/institutional use; congregate care; hotel/conference center; residential lands; and municipal lands.

The BRAC 95 decisions, which came after adoption of the Reuse Plan, affect several parcels at NAWCAD that were to be retained by the Navy under BRAC 91. The likely reuse of these BRAC 95 facilities is incorporated into this EIS, as the FLRA is already addressing these additions, and prospective users of the properties have been identified. Properties involved include the dynamic flight simulator buildings (Bldgs 70 and 72), the inertial laboratory (Bldg 108), and extensions of the main complex of buildings (Bldgs 125 and 138). The acreage accommodating the enlisted family housing and the six officer family housing units on Jacksonville Road would be retained for Navy families serving NASJRBWG.

The proposed Reuse Plan (Figure S-1, The Reuse Plan) emerged that incorporated: 1) the March 1995 FLRA plan (ERA, 1995); 2) BRAC 95; and 3) assumptions regarding likely reuses based upon discussions with the FLRA (Rockwell, January 5 and March 25, 1996). The acreages presented for each proposed land use component are based on approximate delineations and can be summarized as follows:

- Multi-Business Complex - Multi-business complex and R&D uses of the existing main complex (Bldgs 1, 2, and 3) totaling 46 acres (19 hectares).
- Dynamic Flight Simulator - Bldgs 70 and 72 are associated with the existing dynamic flight simulator and occupy three acres (one hectare) at the extreme west of the base.
- University/Institutional - Largely a new complex occupying 84 acres (34 hectares) for an estimated 2,000 students. Also included is the proposed reuse of BRAC 95 relinquished Bldgs 125 and 138, west of Jacksonville Road, which comprise 12 acres (five hectares). (The combined acreage for the University/Institutional component of the Reuse Plan is therefore 96 acres [39 hectares]). These facilities would be occupied by approximately 700 students and faculty.
- Industrial/Business - A new industrial/office space complex of 159 acres (64 hectares) immediately east of Jacksonville Road with frontage on Street Road.
- Hotel/Conference - A new ten-acre (four-hectare) facility adjacent to the Industrial and Business Park, with frontage on Street Road at the location of the proposed major new access way into the redeveloped NAWCAD.

The Reuse Plan

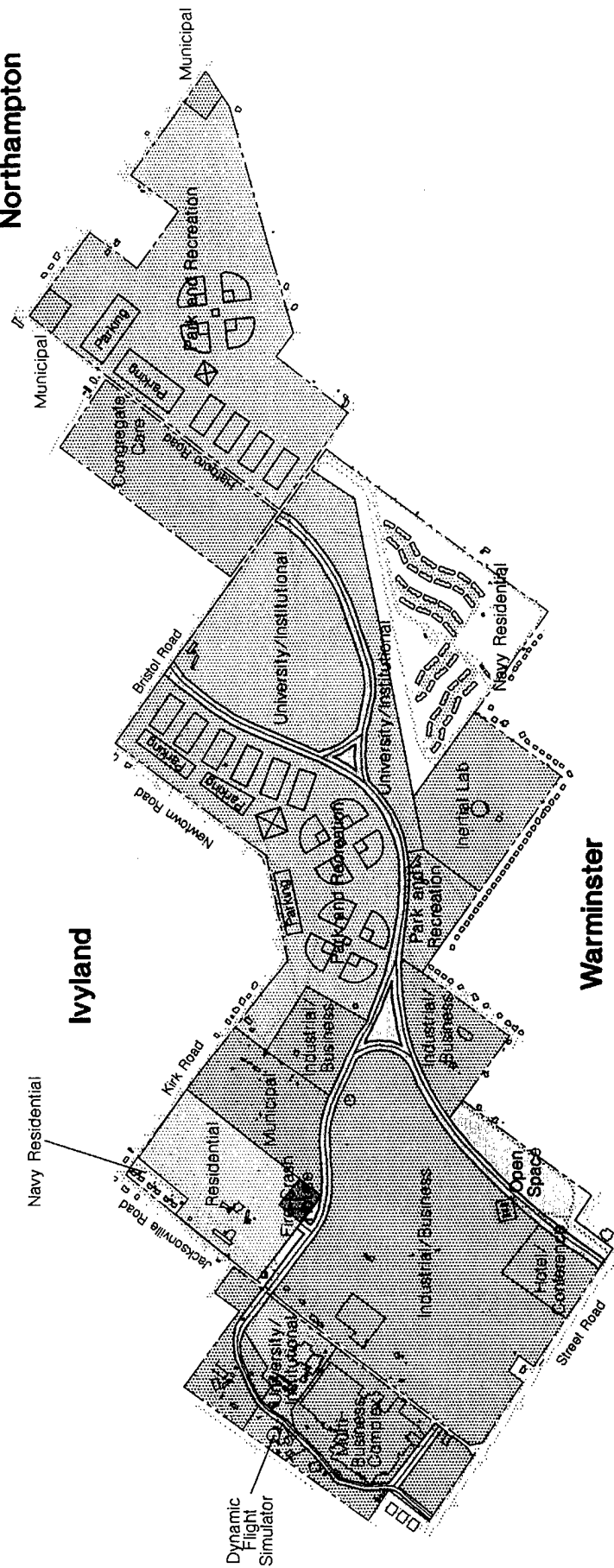
Warwick

Northampton

Ivyland

Warminster

Upper
Southampton



	Park and Recreation		Industrial/Business		Hotel / Conference
	Congregate Care		Municipal		ROW-Open Space
	University/Institutional		Residential		Proposed Road
	Navy Residential		Fire Crash House		Property Boundary
	Inertial Lab & Dynamic Flight Simulator		Multi-Business Complex		

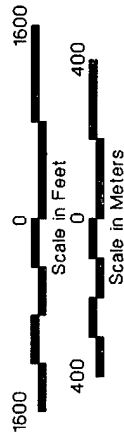


Figure S-1

- Residential - A new single-family residential complex of 150 to 200 homes (ERA, 1995) on 34 acres (14 hectares) in Ivyland Borough.
- Fire/Crash House - An existing facility located on two acres (one hectare) northeast of the hangar.
- Municipal - 30 acres (10 hectares) are set aside for potential municipal uses.
- Congregate Care - A new facility for senior living occupying 38 acres (15 hectares) in Northampton, with a current estimate of approximately 500 residents.
- Inertial Lab - The existing inertial laboratory at Bldg 108. It is situated on 31 acres (13 hectares) in the south central section of the base.
- Park and Recreation - Parkland and open space buffers proposed for 122 acres (49 hectares) in Warminster and 124 acres (50 hectares) in Northampton for a total of 246 acres (100 hectares).
- Right-of Way (ROW) and Open Space - land use elements of the Reuse Plan would be tied together by a proposed new internal road system and series of "gateway" design elements occupying 62 acres (25 hectares).

The main complex of 64 acres (26 hectares) accommodating 199 family units and the six officer family units comprising three acres (one hectare) on Jacksonville Road (total of 67 acres [27 hectares] of Navy Housing) would be retained for Navy families serving NASJRBWG.

The Reuse Plan anticipates that approximately 7,600 jobs can be generated at the base over a build period of 15 years. Order of magnitude infrastructure cost estimates including roadways and traffic signalization improvements total approximately \$21 million (ERA, 1995). Table S-1 provides data on the land use program for the Reuse Plan.

The Reuse Plan (ERA, March 1995) cites nine proposals for the Redevelopment Act of 1994, involving use of facilities to provide help with housing, food, and other material assistance for homeless and low income persons, i.e., a group home residence for pregnant and parenting teen mothers; a residence for five or six rehabilitated mentally ill persons; a medical center for maternal and child health programs. Three of the nine proposals have received FLRA Board approval and are slated for review by HUD (Bass, July 2, 1996).

Table S-1

Reuse Plan Land Use Program

Use	Land Acreage			Estimated Square Feet of Development (Square Meters)
	Acres	Hectares	Percent of Total	
Multi-Business Complex	46	19	6	1,200,000 (111,000)
Dynamic Flight Simulator (BRAC 95)	3	1	<1	72,000 (6,700)
University/Institutional West of Jacksonville Road (BRAC 95) East of Jacksonville Road Subtotal	12 84 96	5 34 39	12	1,600,000 (15,000)
Industrial/Business	159	64	19	1,850,000 (172,000)
Hotel/Conference	10	4	1	50,000 (5,000)
Residential Navy (retained) New (150 - 200 units) Subtotal	67 34 101	27 14 41	12	n/a
Fire/Crash House	2	1	<1	n/a
Municipal	30	12	4	n/a
Congregate Care	38	15	5	250,000 (23,000)
Inertial Lab	31	13	4	25,000 (2,300)
Park and Recreation	246	100	30	n/a
ROW-Open Space	62	25	8	n/a
Total	824	333	100	
<p>Notes: Land use acreage and amount of development are approximate based on estimates for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions. n/a = square feet not appropriate measure of development.</p> <p>Source: Based on Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995; and incorporating assumptions of BRAC 95 property reuse based on interviews with staff of the Federal Lands Reuse Authority of Bucks County, January 1996.</p>				

To implement the Reuse Plan, Bucks County established the FLRA in early 1995. The FLRA is empowered to carry out the business of redeveloping NAWCAD, including management, leasing, property improvements, and future planning. The FLRA's mandate is to execute the conversion process, utilizing all appropriate resources and techniques. These may include: financing through grant applications and private funding; marketing through coordination with other regional and state programs, as well as targeting and follow-up of opportunities; development through property acquisition, surveys, planning, and construction; and general management. The intent is for the authority to achieve its development objectives, transfer all the property to private or municipal ownership, and then phase itself out of existence.

S.2.2 No Action Alternative

The no action alternative, developed as the future baseline condition against which the impacts of the proposed action are measured, means that NAWCAD is closed (except the officer family housing and enlisted family housing), all military activities are relocated and the land is not disposed - it remains as federal government land. The operation of the Navy family housing complex with 199 family units for enlisted personnel and six family units for officers would be transferred to NASJRBWG.

Continued government ownership of the property would have no benefit to the Navy as the Navy would incur continued liability for an asset with no functional, operational, or strategic value and violate federal property management regulations. Continued federal government ownership would also have no benefit for the local community since such ownership would prevent the possibility of viable and productive use of the land.

S.2.3 Residential Alternative

Under this alternative the mostly-undeveloped airfield east of Jacksonville Road would be developed primarily for residential uses plus local recreational facilities (Figure S-2, Residential Alternative). The Residential Alternative differs from the Reuse Plan because it incorporates the 250-acre (101-hectare) golf/residential component considered in the reuse planning process but rejected for the proposed Reuse Plan. The golf/residential component adds 400 dwelling units, so the residential alternative would add 400 units to the 150 to 200 units on the Ivyland site (as described for the Reuse Plan) for a total of approximately 575 new dwelling units (these would be in addition to the congregate housing, plus any proposed McKinney housing).

Table S-2 provides data on the land use program for the Residential Alternative. This alternative has no sponsor. The alternative incorporates the following components in relation to the Reuse Plan:

- Maintains the multi-business complex concept for the existing buildings on the 46 acres (19 hectares) west of Jacksonville Road, but would reduce the scale of the industrial/business park to 65 acres (26 hectares);
 - University/institutional use would include the 12 acres (five hectares) associated with Bldgs 125 and 138;
 - The congregate care and recreational uses in Northampton Township would be the same as in the Reuse Plan; and
 - The residential use in Ivyland would also be the same as in the Reuse Plan.
-

S.2.4 Aviation Alternative

An analysis was performed to determine the feasibility of civilian aviation reuse of NAWCAD. Both available data and interviews indicated that good commercial air passenger service is already available in the area; some smaller firms did feel that NAWCAD could provide an attractive alternative to Philadelphia International Airport for air cargo shipment. Additionally, although further research indicated that the eight airports closest to NAWCAD appear capable of providing adequate commercial passenger or scheduled air cargo service, there did appear to be a demand for additional facilities for accommodating general aviation aircraft in the area, particularly in terms of hangar and tie-down space. Based on this research, there is potential for general aviation activity at Warminster and possibly some limited non-scheduled air cargo operations (i.e., aircraft hired to pickup or deliver items on a periodic basis).

Accordingly, a forecast of general aviation (GA) activity with some limited non-scheduled air “cargo” flights was prepared for the Warminster site using 1994 as the base year, 2000 as the short-term projection and 2010 as the planning horizon. These forecast levels assume similar operations per based aircraft as those identified for nearby airports of the same Federal Aviation Administration (FAA) classification. It is assumed that the largest aircraft (or the airport’s critical aircraft) to be accommodated at NAWCAD would be a twin-engine piston aircraft like a Cessna 414. The FAA uses a design aircraft as the primary criterion for airport design. Consequently, the airport’s design classification would be called Basic Utility, which has the general runway criteria of 3,800 feet (ft) (1,160 m) long, by 60 ft (18 m) wide.

Residential Alternative

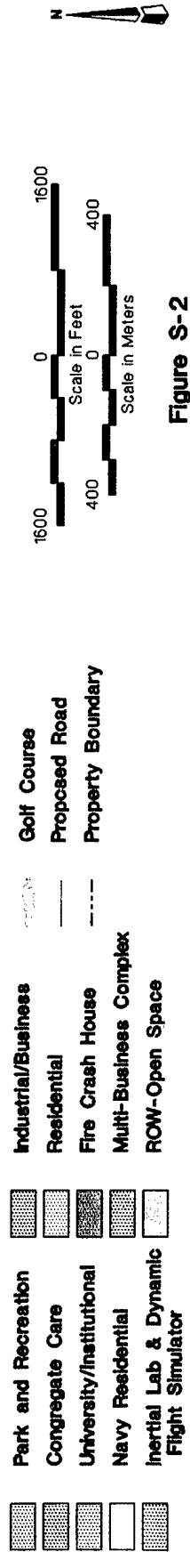
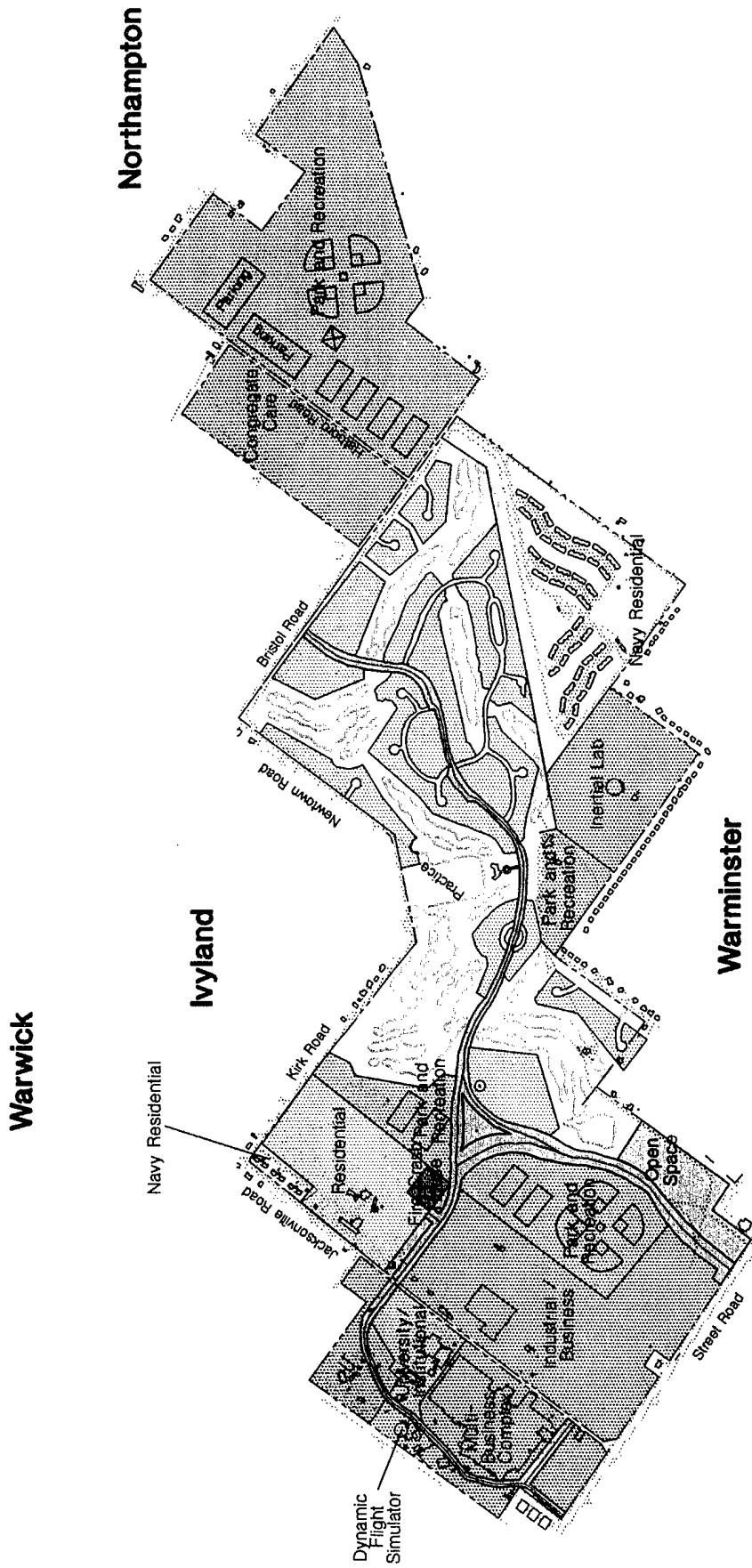


Table S-2

Residential Alternative Land Use Program

Use	Land Acreage			Estimated Square Feet of Development (Square Meters)
	Acres	Hectares	Percent of Total	
Multi-Business Complex	46	19	6	1,372,000 (128,000)
Dynamic Flight Simulator	3	1	<1	72,000 (6,700)
University/Institutional (existing buildings)	12	5	1	14,000 (1,300)
Industrial/Business	65	26	8	636,000 (59,000)
Residential				
Navy (retained)	67	27		
New (175 new units)	34	14		
Golf/Residential (400 new units)	250	101		
Subtotal (575 new units)	351	142	43	n/a
Congregate Care	38	15	5	250,000 (23,000)
Inertial Lab	31	13	4	25,000 (2,300)
Park and Recreation	210	85	25	n/a
ROW-Open Space	68	28	8	n/a
Total	824	333	100	n/a
<p>Notes: Land use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions. n/a = square feet not appropriate measure of development.</p> <p>Source: Based on Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995; and incorporating assumptions of BRAC 95 property reuse based on interviews with staff of the Federal Lands Reuse Authority of Bucks County, January 1996.</p>				

Some constraints, however, have been identified. There is a good likelihood for airspace conflict during all-weather/Instrument Flight Rules (IFR) conditions with the Northeast Philadelphia and Trenton-Mercer Airports, as a portion (holding pattern) of the IFR-reserved airspace for these two airports' instrument approaches already overlaps, without the further complication of a third airport. Potential airspace conflicts and complexity of integrating operations also involves Naval Air Station Joint Reserve Basin Willow Grove, located approximately four mi (six km) west of the NAWCAD site.

In all likelihood, these airspace considerations would limit any activity at Warminster to easy approaches and arrivals only and not make it a candidate for any type of approach in poor visibility conditions.

Another important consideration is the willingness of a local sponsor to own and operate the facility. No apparent willingness has been expressed by local governments to operate Warminster. In view of the airspace constraints which limits the growth potential, there may not be any local support that could develop.

The aviation activities for this Basic Utility GA airport with its shortened runway are projected to require 168 acres (68 hectares), or 20 percent of the 824 acres (333 hectares) at NAWCAD. The remainder of the land would be allocated to uses considered compatible with a GA airport (Figure S-3, Aviation Alternative). Table S-3 provides data on the land use program for the Aviation Alternative. In part, the proposed uses under the Aviation Alternative are identical to the Reuse Plan, but other elements are moved, expanded, or eliminated. The aggregate character of the Aviation Alternative is a more intensive industrial, research, and aviation mix than the other alternatives. Full build-out employment is projected at 9,185 jobs, compared to 7,595 in the Reuse Plan and 5,042 in the Residential Alternative. It should be emphasized that the Aviation Alternative has no sponsor, nor is it considered to be feasible by the FLRA.

S.3 Affected Environment, Impacts of Proposed Action and Alternatives, and Mitigation

S.3.1 Land Use and Zoning

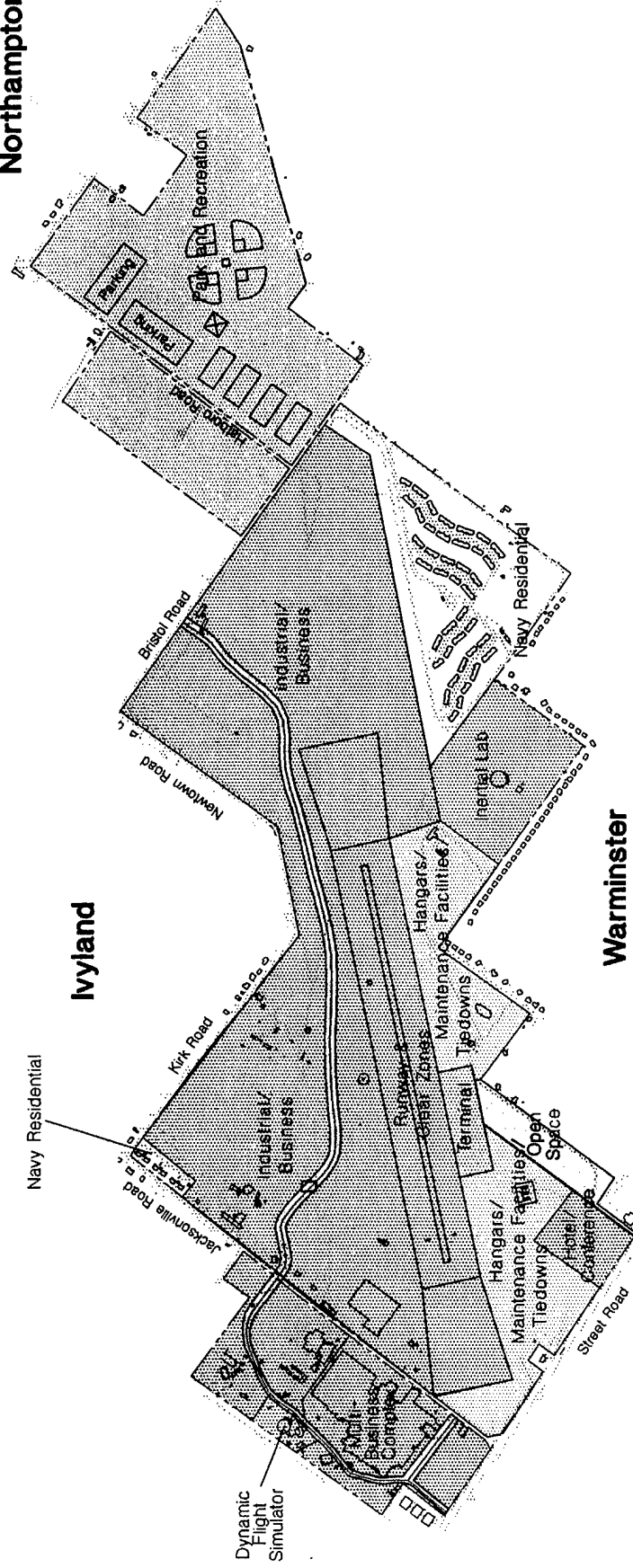
The study area is wholly or partly within the following Bucks County municipalities: Ivyland Borough; Northampton Township; Upper Southampton Township; Warminster Township; and Warwick Township.

Aviation Alternative

Warwick

Northampton

Ivyland



Upper
Southampton

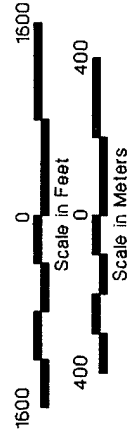
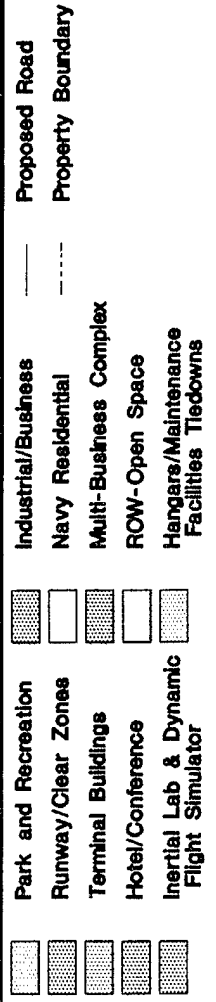


Figure S-3

Table S-3

Aviation Alternative Land Use Program

Use	Land Acreage			Estimated Square Feet of Development (Square Meters)
	Acres	Hectares	Percent of Total	
Multi-Business Complex	46	19	5	1,372,000 (128,000)
Dynamic Flight Simulator	3	1	<1	72,000 (6,700)
Industrial/Business	284	115	34	4,900,000 (59,000)
Hotel/Conference	10	4	1	50,000 (5,000)
Aviation				
Runways & Clear Zones	84	34		
Hangars/Maintenance Facilities Tiedowns	77	31		
Terminal	7	3		
Subtotal	168	68	20	n/a
Residential (Existing Navy)	67	27	8	n/a
Inertial Lab	31	13	4	25,000 (2,300)
Park and Recreation	162	66	20	n/a
ROW-Open Space	53	21	6	n/a
Total	824	333	100	
<p>Notes: Land Use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions. n/a = square feet not appropriate measure of development.</p> <p>Source: Based, in part, on Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995; and incorporating assumptions of BRAC 95 property reuse based on interviews with staff of the Federal Lands Reuse Authority of Bucks County, January 1996.</p>				

The land use pattern at NAWCAD reflects its 54-year history as an aircraft development center. The 824-acre (333-hectare) facility may be broadly categorized into several distinct land uses: operations, administrative, housing, community facilities, maintenance, research, and conservation/buffer. On the NAWCAD property west of Jacksonville Road is a distinct cluster of industrial and research buildings. East of Jacksonville Road, aviation uses occupy the largest portion of the property. South of the runway is a separate facility for inertial guidance research and development. To the east are 199 Navy family housing units for enlisted personnel, eight housing units for officers, six of which are located along Jacksonville Road, and other quarters and support buildings.

Off site, land use pattern in this section of Bucks County is largely the result of suburban outgrowth from the city of Philadelphia. The area to the south, west, and northwest of NAWCAD was mostly developed during the 1960s and 1970s. The northern part of the county is still mostly agricultural and rural residential. The study area location is at the transition zone between suburban Philadelphia and the rural setting of upper Bucks County. Consequently, the area northeast of NAWCAD is presently at the cutting edge of suburban growth. Most of this development is medium to large-lot single-family residential subdivisions in Northampton Township. Much of the vacant and agricultural land in the study area is likely to be absorbed by development as sewer and water services are extended by the township.

The Bucks County Planning Commission provides overall planning guidance in the county, while each locality is responsible for its own land use controls, including review of development plans, zoning and subdivision regulations, and the formulation of comprehensive plans. NAWCAD's approximately 824 acres (333 hectares) lie within three municipalities: 609 acres (247 hectares) are within the Township of Warminster (74 percent); 46 acres (19 hectares) are within the Borough of Ivyland (six percent); and 169 acres (68 hectares) are within the Township of Northampton (20 percent).

No Action Alternative

Under a future baseline (no action) alternative, only the operation of the Navy 199-unit enlisted family housing complex and the six units of officer housing on Jacksonville Road would continue at NAWCAD.

Reuse Plan

Implementation of the proposed Reuse Plan for NAWCAD would result in the continued use and further development of the site as a technologically advanced research and development center, with further expansion into the areas of higher education, more general industrial, business, and office uses, a hotel and conference center, housing (both single-family and senior congregate-care), various municipal uses, and park and recreational uses. The existing airport that accounts for the bulk of the NAWCAD land area would be discontinued and the runway removed. The key land use elements of the Reuse Plan would be tied together by a proposed new internal road system and series of

“gateway” design elements to provide a distinctive sense of place and cohesiveness for the redeveloped complex.

In general terms, the reuse of existing facilities, as with the proposed multi-business complex, would be consistent with existing land uses. However, development of the new facilities and activities would involve a significant change in use from the existing airport (and its ancillary facilities) to the various proposed uses.

Zoning and land use policy for NAWCAD has reflected its status as a military facility. The largest portion, in Warminster Township, had recently been rezoned from a Military Reservation (MR) to a Planned Industrial Park (PIP). However, this rezoning was rescinded by the new Warminster Board of Supervisors. New zoning is being worked on with the County Planning Commission, the Warminster Planning Board, and the FLRA (Bass, July 2, 1996).

Potential permitting issues involve the site proposed for the congregate care facility in Northampton Township; the proposed parkland, also in the Northampton portion of NAWCAD; and the proposed fire house and municipal well. In Ivyland, the 150-200 housing units proposed under the Reuse Plan would require Ivyland Borough to rezone the site, currently zoned to accommodate approximately 100 units, to accommodate the increased density.

Residential Alternative

The Residential Alternative would involve a level of development less intensive than the proposed Reuse Plan, though it shares many basic elements from the proposed Reuse Plan. It differs from that plan in that the university/institutional, municipal use, and hotel/conference center components are eliminated, and the proposed industrial/office park is scaled back. Instead, a 400-unit residential golf community is proposed for a 250-acre (101-hectare) parcel. The residential reuse of much of NAWCAD, as proposed under this alternative, would be in general conformity with the surrounding residential land use in Warminster and Northampton townships.

Permitting and zoning issues would be the same for the Residential and Reuse Plan alternatives.

Aviation Alternative

The Aviation Alternative would involve a level of development slightly more intensive than the proposed Reuse Plan. This alternative also shares many basic elements of the proposed Reuse Plan. It differs from that plan in that the university/institutional uses, congregate care, and residential development are eliminated, and the proposed industrial/office park is shifted north of the runway.

The aviation reuse of part of NAWCAD, as proposed under this alternative, would conform with the historical use of the facility as an airport. Historical use involved military aircraft such as T-2 and A-2 jets, while the proposed use would involve general aviation aircraft. This alternative would, however,

introduce a level of aviation operations substantially greater than has been seen at Warminster for many decades. Issues of compatibility with the surrounding residential land use in Warminster and Northampton townships as these areas have grown over recent decades would undoubtedly be raised.

S.3.2 Socioeconomics

No Action Alternative

Under this alternative, the Navy would entirely vacate NAWCAD, with the exception of the 199-unit enlisted family housing complex and the six units of officer housing on Jacksonville Road. Of the former employees that would remain in the region, many of these would join the region's unemployed pool temporarily while seeking alternate employment. There would be no redevelopment at the base and hence neither new income nor new tax revenues would be generated. Finally, no new housing demand would be created; in fact, the net effect would be a small but noticeable depression in the Philadelphia metropolitan region's housing market, particularly immediately following closure of the base in 1996.

Reuse Plan

The Reuse Plan proposes to introduce some 150 to 200 new homes in the Ivyland section of NAWCAD (ERA, 1995), generating an additional population of approximately 400 to 600 people. Resident level at the congregate care facility proposed in Northampton is currently projected at an estimated 570 seniors. Bucks County Continuum 1994 projections of a more-than-120,000-person increase in the region between 1990 and 2010, and an increase in housing of over 30,000 units during the same time, indicate that the proposed development at NAWCAD would be consistent with, and well within this anticipated growth.

The Reuse Plan proposes to create 7,255 jobs at the redeveloped NAWCAD between the years 1996 and 2010. Relinquishment of the BRAC 95 properties and the anticipated reuse of those facilities would provide an additional 340 jobs, for a direct employment total of 7,595 jobs. This represents less than 2.5 percent of the 1995 resident labor force. The total projected direct annual earnings of this proposed employment, in 1995 dollars, would be almost \$199 million.

In addition to permanent jobs, temporary jobs associated with construction activity and indirect employment resulting from earnings circulating in the region would be generated. Based on estimated construction costs of \$216 million, it is possible to predict that 2,168 direct construction jobs with an estimated \$70 million in total earnings would be created. Total direct and indirect employment for the alternative is estimated at 15,684 jobs, with indirect employment representing almost 52 percent of this at 8,089 jobs. Total earnings are projected to be over \$365 million.

Much of the result of Reuse Plan development would be brought onto the tax rolls for property taxes or provide payments in lieu of taxes (PILOT). The employment would generate new earned-incomes taxes, and the business activity generally would raise new revenues from business taxes and fees.

Residential Alternative

The Residential Alternative would introduce more residents to the site than would the Reuse Plan, but would reduce the number of anticipated jobs. The golf/residential complex and the Ivyland residential parcel together represent some 550 to 600 households, or 1,540 to 1,680 persons; the anticipated congregate care resident level of approximately 570 seniors should bring that total over 2,000. The estimated housing and population growth, however, is well within projected growth over the period.

Direct employment would be an estimated 5,042 jobs generated, with associated earnings of over \$101 million. Total construction costs are estimated at \$218 million, from which the estimates of 2,191 construction jobs, 3,325 additional jobs in other industries, and a total of 5,516 direct and indirect jobs from construction are derived. Total earnings from direct construction jobs is estimated at \$70.7 million. Total direct and indirect employment is projected at 9,567 jobs, with indirect employment representing 47 percent of this at 4,525 jobs. Total earnings would be almost \$242 million.

For Ivyland and Northampton, the Residential Alternative would have essentially the same fiscal consequences as the Reuse Plan, as the proposed activities do not change, but for Warminster there is a major shift reducing the industrial/office park and university components and substituting the golf/residential element. The fiscal consequence is that earned income tax revenues will decrease by about half, but this reduction will be somewhat compensated for by increases in real property tax from the expanded golf/residential component.

Aviation Alternative

The Aviation Alternative would introduce no new residents to the site, but would increase the total anticipated direct jobs by nearly 9,200. Housing on the site would reduce to zero, but in the area would amount to approximately 4,600 new units induced by this alternative. As with the Reuse Plan, the Aviation Alternative is unlikely to present unexpected or problematic growth to Bucks County; however, in this case the estimated induced housing development accounts for about one-third of projected growth in the county over the period.

The estimated total construction costs are \$142.3 million. Total direct and indirect employment is computed at 20,873 jobs, with indirect employment representing 56 percent of this, or 11,688 jobs. Total earnings are projected to be almost \$462 million, of which \$211 million are generated indirectly.

As with the Reuse Plan, the Aviation Alternative would result in fiscal benefits from the redevelopment of NAWCAD. The estimated number of jobs generated would be 21 percent greater than under the Reuse Plan, and earnings are anticipated to be \$52 million higher; hence associated tax, PILOT and other revenues would be higher, and could be significant in some cases, as with Warminster where full build-out anticipated annual earned income tax revenue of \$2.5 million represents an 80 percent increase over the 1995 budget.

S.3.3 Community Services

Community services fall into two general categories: those directly involving the NAWCAD facility itself, such as the emergency services of police, fire, and ambulance, and other services not necessarily NAWCAD-specific, such as schools, health care, and parks and recreation.

No Action Alternative

There would be no redevelopment at the base under the no action alternative, thus there would be no new demand created for community services.

Reuse Plan

In comparing the projected distributions of the new student population under the Reuse Plan to recent student populations, the increment that these new students represent is very small. With respect to health care, the redevelopment of NAWCAD under the Reuse Plan would be unlikely to present any particular problems for the county's health care facilities.

With respect to fire protection, the Navy had, until late 1995, mutual aid agreements with local fire services where Navy fire crews were typically first-on-the-scene respondents during the daytime. Warminster Township is currently considering full-time fire department employees, particularly for the day shift, due in part, to both local need and the closure of NAWCAD. Also, Ivyland borough officials indicated the need to expand its fire and police services with the redevelopment of NAWCAD under the Reuse Plan.

Residential Alternative

The Residential Alternative generates even fewer students than the Reuse Plan, and therefore no adverse impact to schools would be anticipated. Anticipated impacts upon health care service would be less than under the Reuse Plan. With respect to public safety and emergency services, the increase in the local tax base from private redevelopment of the base and the new wage tax revenues are expected to support the small increments in service capacity that would be needed.

Aviation Alternative

Existing facilities would accommodate implementation of the Aviation Alternative with little impact.

S.3.4 Transportation

In order to compare historical traffic volumes associated with NAWCAD to projected traffic volumes resulting from the three action alternatives, the number of trips generated at the time of the decision to close NAWCAD (April 1991) was computed. Table S-4 reflects trips generated during am and pm peak periods and total daily trips for NAWCAD in April 1991 and for each action alternative.

Table S-4
Generated Vehicle Trips

Time Period	NAWCAD (April 1991) ¹	Reuse Plan	Residential Alternative	Aviation Alternative
AM	1,844	3,721	2,188	4,001
PM	1,844	3,826	2,367	4,030
Daily Trips	10,310	26,410	18,051	27,044
Note: ¹ Decision to close NAWCAD				

No Action Alternative

Future traffic volumes under the no action alternative were estimated based on historical traffic conditions and changes in the study area as well as future changes in traffic generators (residential and employment centers likely to be constructed, expanded or closed by the build year of 2010). An annual growth rate of one percent per year was chosen to account for general traffic growth in the area. The street network was assumed to remain similar to existing conditions except for minor signalization improvements. Findings indicated that despite the closure of NAWCAD, background traffic growth and other nearby developments would cause further degradations in Level of Service (LOS) at the intersections studied. Poor operation (LOS E or worse) would be expected at all study area intersections.

Reuse Plan

The proposed site development would result in the continued use and further development of the site for research and development, general industrial and office development, housing (single-family and

congregate), and recreation. According to the FLRA, the original educational/institutional use intended for a portion of the site would most likely be industrial, so the traffic analysis has assumed the industrial option as a worst case scenario.

Implementation of the Reuse Plan would generate an estimated 26,410 additional daily trips to the site, creating considerable traffic delays at all study area intersections, since the existing street network offers limited residual capacity. All intersections would operate at unacceptable levels (LOS F) during the peak hours. Increased use of the existing public transit system would be expected; the system does have the capacity to accommodate additional passenger loadings.

Several potential mitigation measures have been investigated, including signal modifications, geometric improvements, and regulatory measures. The feasibility of introducing mitigation measures at each intersection impacted was evaluated. The configuration of certain intersections would preclude further widening (i.e., existing left turn lanes), while others support adjacent development that would be substantially impacted if geometric improvements were undertaken.

Despite these improvements several intersections continue to operate at undesirable levels. Also, other intersections for which mitigation is not feasible would continue to operate poorly. Therefore, other mitigation measures such as staggered work hours and ride-sharing would be necessary, but have not been evaluated here.

Residential Alternative

The Residential Alternative would involve increased residential development but diminished industrial use. Although this alternative generates fewer vehicles than the preferred alternative, local street operations would remain constrained during the am and pm peak hours. Though the impacts lessen slightly, the intersections would remain at poor LOS.

Mitigation measures would be as described for the Reuse Plan.

Aviation Alternative

The Aviation Alternative would generate a slightly higher number of additional trips to the site than the Reuse Plan Alternative. Impacts of this alternative would be slightly more substantial than those described for the Reuse Plan.

Mitigation measures would be the same as described for the Reuse Plan.

S.3.5 Air Quality

The purpose of this microscale air quality analysis is to evaluate the impacts of traffic related carbon monoxide for the Reuse Plan and alternatives. Average hourly carbon monoxide (CO) concentrations were predicted for the peak am and pm one-hour traffic periods using an air pollutant dispersion model.

No Action Alternative

Analysis indicated no mobile source emission violations of the National Ambient Air Quality Standards (NAAQS) CO one-hour standard of 35 parts per million (ppm) and eight-hour standard of nine ppm for both am and pm peak periods under the no action alternative. With respect to stationary source emissions, only the six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex would continue to be occupied, and stationary source emissions would, therefore, decrease substantially.

Reuse Plan

As for traffic, the industrial option rather than the educational/institutional use option, was used as a worst case scenario for air quality analysis, based on conversations with the FLRA. The results of the microscale air quality analysis for the Reuse Plan show no violations of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of nine ppm. While CO levels would be higher under the Reuse Plan than the future no action baseline at all locations due to increased traffic, the increases are not significant.

The long term impact on air quality that would arise from stationary emission sources, including heating units, would depend upon the nature and extent of the activities conducted on the property. The Pennsylvania Department of Environmental Protection would have jurisdiction over these emission sources, and it will be necessary for all such sources to comply with agency standards. Certain sources will require appropriate permits from the Pennsylvania Department of Environmental Protection.

Air quality impacts from construction activity would be from fugitive dust on-site and mobile source emissions from construction vehicles, equipment, and worker automobiles. The former would be mitigated easily by using water to control the dust during demolition and construction; mobile source emissions are construction activity-specific, not significant, and thereby short-lived.

Residential Alternative

CO modeling demonstrated that under the Residential Alternative, CO levels would be higher due to increased traffic; however, there would be no violations of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of nine ppm. As described for the Reuse Plan, the long term impact on

air quality that would arise from stationary emission sources, including heating units, will depend upon the nature and extent of the activities conducted on the property. The Pennsylvania Department of Environmental Protection will have jurisdiction over these emission sources.

Aviation Alternative

Under the Aviation Alternative, CO levels would also be higher due to increased traffic; however, there would be no exceedances of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of nine ppm. As previously described, The long term impact on air quality that would arise from stationary emission sources, including heating units, will depend upon the nature and extent of the activities conducted on the property. The Pennsylvania Department of Environmental Protection will have jurisdiction over these emission sources.

S.3.6 Noise

The methodology for predicting future noise levels is based on the assumption that existing noise levels are dominated by, and are a function of, existing traffic volumes, and that future noise levels can be determined based on the proportional increase in traffic (on a logarithmic basis) associated with a project. Aviation noise levels are analyzed in similar fashion.

No Action Alternative

All increases in noise levels from existing conditions to future no action conditions are less than or equal to one decibel.

Reuse Plan

Changes in noise levels due to implementation of this alternative were determined by adding the noise attributable to development-generated traffic to noise levels previously calculated for the future no action alternative. The hourly L_{eq} analysis shows that with the exception of a few hours of the day, noise levels would increase less than or equal to one decibel from the no action to the Reuse Plan Alternative.

With regard to stationary sources such as exterior mechanical equipment (e.g., fans, compressors), all would be designed to comply with applicable ordinances. There would be no significant impact from these sources. Noise generated by construction activity would be restricted to the daytime, would be finite in nature, and would not be expected to have any significant impact.

Residential Alternative

Given the trip generation rate estimates of the Residential Alternative, future mobile source noise levels would be less than those associated with the Reuse Plan, already found not to have a significant impact. Stationary and construction noise impacts would be similar to those previously described.

Aviation Alternative

Aircraft noise levels are typically expressed in terms of decibels (dB). A variety of noise metrics have been developed to evaluate aircraft noise levels. Of these, the Day-Night Average Sound Level (DNL) is currently the official accepted metric of the Federal Aviation Administration (FAA). For this EIS, DNL levels equal to and greater than 65 dB were used for assessing community noise impact.

Potential aircraft operations for the site were developed for analysis purposes based on the potential interest in general aviation activities in the Warminster area. Extensive forecasting and modeling revealed that the noise impact from implementing the general aviation alternative would not be significant due to the type of aircraft and light aircraft traffic predicted. Any land acreage affected by noise levels higher than 65 dB would be within the runway's clear zones; no significant noise impact would be expected from this alternative.

Historic noise levels at NAWCAD were reviewed for comparative purposes with the proposed Aviation Alternative. Contours above 60 dB for 1988 operations at the NAWCAD airfield were reported (Harris Miller Miller & Hanson Inc., 1989). The noise impact from the Aviation Alternative would be significantly less than what occurred in 1988. The difference is attributable to the different type of aircraft operations. The noise level from general aviation aircraft would be low compared with military aircraft such as T-2 and A-7 jet aircraft.

S.3.7 Infrastructure

Infrastructure involves such systems as electricity, steam production, potable and non-potable water, wastewater system, stormwater system, solid waste, and other utilities.

No Action Alternative

Under the no action alternative there would be no redevelopment at the base. There would thus be little or no new demand created for utilities under the no action alternative. The six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex to be transferred to NASJRBWG would continued to be occupied by the Navy. It is assumed that local municipalities

would provide utility services to this housing. These conditions describe the baseline condition assumed for the no action alternative.

Reuse Plan, Residential, and Aviation Alternatives

In the case of infrastructure, existing conditions and projected impacts are similar for each of the three action alternatives.

- Electricity - Would continue to be provided by PECO Energy; further analysis would be required to address gradual replacement and upgrade of the distribution system based on actual implementation requirements.
- Steam production - Anticipated to be ample for all alternatives.
- Water Supply - Currently a combination of purchased supply from Warminster Municipal Authority and water from existing wells on the NAWCAD property. Per capita water usage is estimated at 35 gallons (132 liters) per day. Under all alternatives, daily demand would exceed historic usage. Alternative sources have been explored and would apply to all action alternatives. These include incorporation of some of NAWCAD's existing wells into the adjacent municipal authority systems; expansion of Warminster Municipal Authority's distribution system to increase supply; and addition of Northampton Municipal Authority as a supplier. All options require further study.
- Wastewater system - Per capita sanitary flow is estimated at 35 gallons (132 liters) per day for industrial use and 100 gallons (379 liters) per day for residential use, within the amount of available capacity at the Warminster Wastewater Treatment Plant for each alternative. National Pollution Discharge and Elimination System (NPDES) requirements need to be met for all alternatives.
- Stormwater system - Construction activities associated with the development of each alternative would be subject to the NPDES permit program. Potential increases in impervious surface under each alternative are as follows:
 - Reuse Plan - 340 acres (138 hectares);
 - Residential Alternative - 210 acres (85 hectares);
 - Aviation Alternative - 470 acres (190 hectares).
- Solid waste - Disposed of by private contractor; for each alternative, although generation of solid waste would exceed historic per capita waste generation rates, no significant impact is anticipated.

- Other - Gas is provided by the PECO Energy; existing telephone lines are available; no problems are anticipated.

S.3.8 Cultural Resources

The cultural resources survey conducted at NAWCAD (TAMS and John Milner Associates, 1996) identified seven structures that could be considered eligible for the National Register of Historic Places; three are excellent examples of late 18th and early 19th century stone farmhouses and their outbuildings, and the others have been integral in the history of military activities at NAWCAD.

No Action Alternative

Under a no action alternative there would be no new construction or alteration in the area of the historic buildings. Closure of designated areas of NAWCAD would follow Naval Facilities Engineering Command standards and procedures for mothballing facilities.

Reuse Plan

There should be no adverse effect on Bldgs 100, 101, and 87, the 18th and early 19th century structures, under this alternative. Bldg 108, the inertial guidance laboratory, and Bldg 70, the centrifuge, are to continue in their present use under the Reuse Plan; hence there should be no finding of adverse effect. Structure 361, the ejection tower, will be moved to Naval Air Warfare Center Aircraft Division Patuxent River. It is designed to be moveable and has been moved at least once before, so another move is not expected to affect the structure's historic character.

Structure 367, the aircraft support tower, would be disassembled. This action would have an adverse effect because it involves the physical destruction, damage, or alteration of all or part of the property. This finding of adverse effect requires that the Navy consult with the Advisory Council on Historic Preservation and the Pennsylvania State Historic Preservation Officer (SHPO) in accordance with Section 106 of the National Historic Preservation Act (NHPA).

The primary method of mitigation that could be required is documentation of the demolished structures and its setting to record significant characteristics of the property before its destruction. Documentation may include preparation of a written description and history, large format photographs printed to archival specifications, or measured or sketched drawings. These items are generally prepared in accordance with Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER) or Commonwealth of Pennsylvania guidelines. Should documentation be selected as a mitigative measure, the SHPO may require that the National Park Service be consulted to determine the appropriate type and extent of documentation.

Residential Alternative

The impacts on cultural resources at NAWCAD under the Residential Alternative would be the same.

Aviation Alternative

The impacts on cultural resources at NAWCAD under the Residential Alternative would be the same.

S.3.9 Natural Resources

No Action Alternative

Under the no action alternative, existing natural resources would remain unchanged and all identified wetlands in the area would remain intact.

Reuse Plan

The status of and potential impacts to natural resources resulting from implementation of this alternative are as follows:

- Vegetation - Existing vegetation on and around NAWCAD is a combination of low-value communities, farmland, and degraded woodland. Development would result in decrease in amount of low-value vegetation and a change of some farmland to park and recreational land with no expected significant impact.
- Wildlife - No significant impact to wildlife or threatened or endangered species is expected.
- Wetlands - There is indication of a small acreage of freshwater wetlands (one to five acres [0.4 to two hectares]) on the site. The Reuse Plan, serving as a development design framework, does not contain detailed site plans; specific impacts of the reuse on wetlands would depend on future specific site plans.

Analysis for any proposed project under the Reuse Plan that would affect wetlands must consider avoiding impacts to wetlands as described in the *Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404 (b)(1) Guidelines*.

Any disturbances to wetlands would require a permit from the US Army Corps of Engineers (COE) and the PA Department of Environmental Protection.

- Floodplains - Because NAWCAD does not lie within the 100-year or 500-year floodplain, there would be no impact on floodplains.
- Topography, Geology, and Soils - All persons engaged in the earthmoving activities associated with development would be required to develop and implement soil erosion and sedimentation control measures, set forth in a specific plan, and obtain an earth distribution permit from Pennsylvania's Bureau of Soil and Water Conservation prior to commencement of work.

Residential Alternative

The situation, potential activities, potential impacts, and required actions and mitigation for development under the Residential Alternative are the same as under the Reuse Plan.

Aviation Alternative

The situation, potential activities, potential impacts, and required actions and mitigation for development under the Aviation Alternative are the same as under the Reuse Plan.

S.3.10 Petroleum and Hazardous Substances

NAWCAD has been designated as a National Priorities List (Superfund) site. The Navy's Installation Restoration (IR) Program is currently conducting remedial actions (supported by required investigations) at known disposal sites. Environmental Baseline Survey work is underway to support Findings of Suitability to Transfer (FOST) documentation for all NAWCAD property.

No Action Alternative

Under the no action alternative, the Navy would continue to provide for cleanup of contaminated sites as identified in the Federal Facilities Agreement between the Navy and EPA (September 1990). With the closure of NAWCAD in September 1996, use of most hazardous materials would cease. There may be some use of chemicals in the Pump and Treat Facility constructed as part of the groundwater cleanup program. Environmental compliance activities at NAWCAD would continue for all facilities.

Reuse Plan

With implementation of the Reuse Plan, the use of hazardous materials by the Navy at NAWCAD would cease. Environmental compliance activities at NAWCAD would continue for storage tanks, hazardous substances and hazardous waste, polychlorinated biphenyls (PCBs), asbestos, and NPDES permits per the *BRAC Cleanup Plan* (BRAC Cleanup Team and EA Engineering, March 1995).

Operation and maintenance of private industries located in the area of the new industrial/business/office R & D complex may generate hazardous substances, but amounts cannot be quantified at this time, as the nature of those industries are not known.

With regard to site contamination, the 1995 Environmental Baseline Survey at NAWCAD determined that releases of hazardous waste or substances to the soil and/or groundwater have occurred within four areas on the property, A, B, C, and D. In each of these areas, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a Remedial Investigation (RI). In addition, for each area, and for the remaining property targeted for transfer, studies must be conducted to determine if hazardous substances, hazardous wastes, and/or petroleum products have been stored, released, or disposed. If release or disposal of such substances is confirmed, CERCLA and/or RCRA cleanup requirements must be met prior to property transfer.

The BRAC Cleanup Team (BCT) is coordinating with the FLRA in addressing the environmental issues related to transfer parcels scheduled for reuse. In addressing the cleanup levels, the BCT would give consideration to BRAC future land use as identified in the proposed Reuse Plan.

Residential Alternative

Under this alternative, reduction of the scale of the industrial/business park to 65 acres (26 hectares) would reduce the amount of hazardous substance generated. Site contamination issues would be handled as previously described.

Aviation Alternative

Operation of the airfield under this alternative would generate petroleum and hazardous substances during routine operation and maintenance. Also, the scale of the industrial/business/office park would increase, so the potential for increased generation of hazardous substances in this area increases. Appropriate hazardous substance handling, control, and disposal procedures would be needed.

S.3.11 Cumulative Impacts of the Preferred Action

Cumulative impacts upon the study area as a result of the redeveloped NAWCAD would include the phase-out and closure of the base itself. In 1990, base personnel loading totaled 4,605 personnel. This number declined to 1,398 in August 1995 and to 1,129 in May 1996; at the time of closure in 1996, there will be approximately 20 personnel to maintain the facility in caretaker status. The loss of this employment center and its ancillary functions is a significant feature that is included in baseline conditions (e.g., traffic volumes generated by the base have declined, and will continue to decline up to its closure). Impacts generated by a redeveloped NAWCAD have taken into account the anticipated reduction.

Interviews with Bucks County planners and township officials conducted in 1995 and 1996 indicated no major new projects were planned in the study area. The most significant project identified was the new Wal-mart store on Street Road at Jacksonville Road that opened January 1996. The Wal-mart traffic studies submitted to PENNDOT were incorporated into the traffic analysis in Section 4.4. Other proposed projects identified by township officials were:

- a new residential subdivision for approximately 400 units in Warwick Township, beyond the one-mi (1.6-km) study area; and
- a small industrial subdivision of 20 acres (8 hectares) (26 parcels but with no specific projects identified) about one-half mi (one km) northwest of NAWCAD in Warminster.

These other projects are relatively small and are included within the background growth factors used in the traffic analysis or demographic projections for the area.

S.4 Relationship of Proposed Action to Federal, State and Local Plans, Policies and Controls

The proposed action is consistent with relevant federal, state, and local plans, policies, and controls, assuming that remaining remediation of site contamination at NAWCAD occurs as planned, asbestos removal and disposal is achieved in accordance with regulations, and historic district mitigation is performed in accordance with procedures and agreements with the Pennsylvania SHPO and the Advisory Council on Historic Preservation.

S.5 Unavoidable Adverse Effects, Relationship Between Local Short-term Uses, and Enhancement of Long-term Productivity, and Irreversible and Irretrievable Commitments of Resources

The additional vehicular traffic generated by the preferred alternative would create considerable traffic delays at all study area intersections within the vicinity of NAWCAD. Potential mitigation measures for these impacts would include signal modifications, geometric improvements, and regulatory measures. Alteration, demolition, and renovation of buildings at NAWCAD would have unavoidable adverse effects on eligible historic structures, but mitigation would likely be achieved in the form of historic building documentation. Short-term construction and demolition-related effects on traffic levels, air quality and noise would be unavoidable, but impacts could be diminished by phasing of construction, limiting hours of construction noise, and similar measures. There are no other unavoidable adverse effects as a consequence of the proposed reuse of the property.

Irreversible and irretrievable commitments of resources would be made in terms of added quantities of debris to disposal sites as a result of demolition, the commitment of resources (construction materials and land) to the proposed site uses, and the long-term use of resources, such as energy supply, water, sewage treatment, landfill capacity, and road use. On balance, proposed reuse of the property is considered a productive use of the property that does not negatively impact long-term productivity.

S.6 Summary Statement of Environmental Significance

Implementation of the proposed Reuse Plan for NAWCAD is considered to have significant environmental impacts with respect to traffic conditions. The additional vehicular traffic generated by the preferred alternative would create considerable traffic delays at intersections within the vicinity of NAWCAD. Issues to be resolved include the appropriate mitigation for this impact. A summary impact matrix for the proposed Reuse Plan and its alternatives is presented in Table S-5.

Table S-5

Summary Impact Matrix - Disposal and Reuse Alternatives for NAWCAD

Evaluation Parameter	Reuse Plan	Residential Alternative	Aviation Alternative
Land Use	Land uses compatible with existing on-base and surrounding land uses. Proposed residential development in Ivland is slightly more dense than permitted under zoning. New zoning policy being developed for Warminster.	Land uses compatible with existing on-base and surrounding land uses. Proposed residential development in Ivland is slightly more dense than permitted under zoning. New zoning policy being developed for Warminster.	Aviation use is a historic use at the site but the proposed GA airport activity would be greater than experienced for many years and presents potential conflicts with expanded residential development in the surrounding area. Other proposed uses compatible with existing on-base and surrounding uses.
Socioeconomics	<ul style="list-style-type: none"> - 150-200 new homes, generating an additional population of 400-600 people - Creation of 7,595 direct jobs and 8,090 indirect jobs. - Total earnings (direct and indirect) are projected to be over \$365 million 	<ul style="list-style-type: none"> - 550-600 new homes generating an additional population of 1,540-1,680 people - Creation of 5,042 direct jobs and 4,225 indirect jobs. - Total earnings (direct and indirect) are projected to be almost \$242 million 	<ul style="list-style-type: none"> - No new housing on the site, but would induce 4,600 new units in the area - Creation of almost 9,200 direct jobs and 11,688 indirect jobs. - Total earnings (direct and indirect) are projected to be almost \$462 million
Community Facilities	No major adverse impacts foreseen in meeting anticipated growth in demand for services. Benefits would be derived in region from increased employment and income.		
Transportation	Additional vehicular trips generated by Reuse Plan would create considerable traffic delays at all intersections. Roadway improvements would be required to mitigate these impacts.	Additional trips would be generated as compared with the no action alternative; fewer vehicular trips than the Reuse Plan. Level of Service would remain poor at all intersections. Roadway improvements would be required to mitigate these impacts.	Additional trips would be generated as compared with the no action alternative; slightly more vehicles than the Reuse Plan. Level of Service would remain poor at all intersections. Roadway improvements would be required to mitigate these impacts.
Air Quality	No violations of federal or state standards for 1-hour and 8-hour averaging periods. No construction air quality impacts with fugitive dust controls and adherence to asbestos removal and disposal regulations. Minor stationary source emissions from use of boilers for heating and hot water in buildings would have no significant impact on air quality.		
Noise	Increase in noise during some early morning hours would be noticeable, however, existing noise levels are already high and are typical of a suburban neighborhood. No significant impact is anticipated from aviation-related noise associated with the Aviation Alternative.		
Infrastructure	Demand of potable water would exceed historic usage. Potential sources of additional potable water were identified as the Northampton and Warminster Municipal Authorities. Extension of existing water line in Warminster would be required to provide an adequate potable water source, at an approximate cost of \$500,000.		

Table S-5

Summary Impact Matrix - Disposal and Reuse Alternatives for NAWCAD

Evaluation Parameter	Reuse Plan	Residential Alternative	Aviation Alternative
Cultural Resources	<ul style="list-style-type: none"> - One potentially historic structure (367) disassembled. - Adaptive reuse of three historic structures (87, 100, 101). - Mitigation and compliance with prescribed procedures would avoid adverse impacts. 		
Natural Resources	Wetlands could be impacted (if future development would affect wetlands). Any proposed project must consider the avoidance of wetland impacts; only after impacts have been avoided to the greatest extent practicable would other mitigative measures be considered and implemented.		
Petroleum and Hazardous Substances	<ul style="list-style-type: none"> - Industrial users may generate hazardous materials - amounts cannot be quantified as the nature of those users is unknown. - BRAC Cleanup Team is coordinating with FLRA to address cleanup levels for property transfer. - No impacts related to radon, lead-based paint, or asbestos. 	<ul style="list-style-type: none"> - Reduction in scale of hazardous waste generation. - No impacts related to radon, lead-based paint, or asbestos. 	<ul style="list-style-type: none"> - Generation of petroleum and hazardous substances during routine operations. - Overall increase in hazardous waste generation.
Cumulative Impacts of the Preferred Action	Closure of NAWCAD results in the loss of an employment center and its ancillary functions that is a significant feature that is included in baseline conditions. Impacts generated by a redeveloped NAWCAD have taken into account this anticipated reduction. No other new projects are planned in the study area.		

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1 PURPOSE AND NEED

The Naval Air Warfare Center Aircraft Division (NAWCAD) Warminster is located in Bucks County approximately 18 miles (mi) (29 kilometers [km]) north of Center City Philadelphia and 15 miles (6 km) west of the New Jersey/Pennsylvania state line (Figure 1-1, Site Location). It covers approximately 824 government-owned acres (333 hectares). An additional 38 acres (15 hectares) of contiguous land is Navy-controlled for aviation easements. The Oreland Open Water facility is a 15-acre (6-hectare) remote site maintained by NAWCAD that is located about eight mi (13 km) southwest of Warminster in Montgomery County. An Environmental Assessment (EA) is currently underway for the Oreland facility and it is not a subject of this Environmental Impact Statement (EIS).

NAWCAD's mission has been as the principal Navy research, development, test, and evaluation center for naval aircraft systems, and airborne and antisubmarine warfare systems. There are approximately 214 buildings accommodating 1,791,000 square feet (sq ft) (166,400 square meters [sq m]) of space. Activities at NAWCAD are broadly categorized into the following six functions:

- Research and development;
- Airfield operations;
- Industrial;
- Administration;
- Family housing; and
- Personnel support.

1.1 Base Closure and Realignment Act

As directed by the Defense Base Closure and Realignment Act (known as BRAC) and implemented by the 1991 and 1995 BRAC process, the Navy plans to close and dispose of NAWCAD. The majority of the existing aircraft systems research, development, test, and evaluation (RDT&E) functions are to be relocated to the Naval Air Warfare Center Aircraft Division, Patuxent River, Maryland.

The Base Closure and Realignment Act (BRAC) was signed into law on October 24, 1988 (Public Law 101-526) and subsequently amended in November 1990 by Public Law 101-510. The purpose of the BRAC legislation was to provide a fair process that would result in the timely closure and realignment of military installations within the United States. To achieve this, the legislation established nonpartisan Base Closure and Realignment Commissions to review and evaluate military installation closure or realignment recommendations of the Secretary of Defense and to make closure and realignment recommendations to the President and the Congress.

The BRAC legislation also provides certain requirements for compliance with the National Environmental Policy Act (NEPA), including preparation of environmental documentation for actions associated with base closure and realignment. Although the 1988 Act did not specify that environmental documentation be prepared for the disposal of any excess property, the Public Law 510-10 legislation provided specific direction regarding the relationship between the property disposal process and NEPA requirements

Public Law 510-10 legislation set forth procedures for the realignment/closure of US Department of Defense (DoD) installations. It also identified requirements for compliance with NEPA, stating that the provisions of NEPA apply: (1) during the process of property disposal, and (2) during the process of relocating functions from a military installation being closed or realigned to another military installation after the receiving installation has been selected, but before the functions are relocated. In accordance with this legislation, this EIS has been prepared to address the probable impacts of the disposal and reuse of NAWCAD.

1.1.1 Base Closure and Realignment Commission Decision 1991

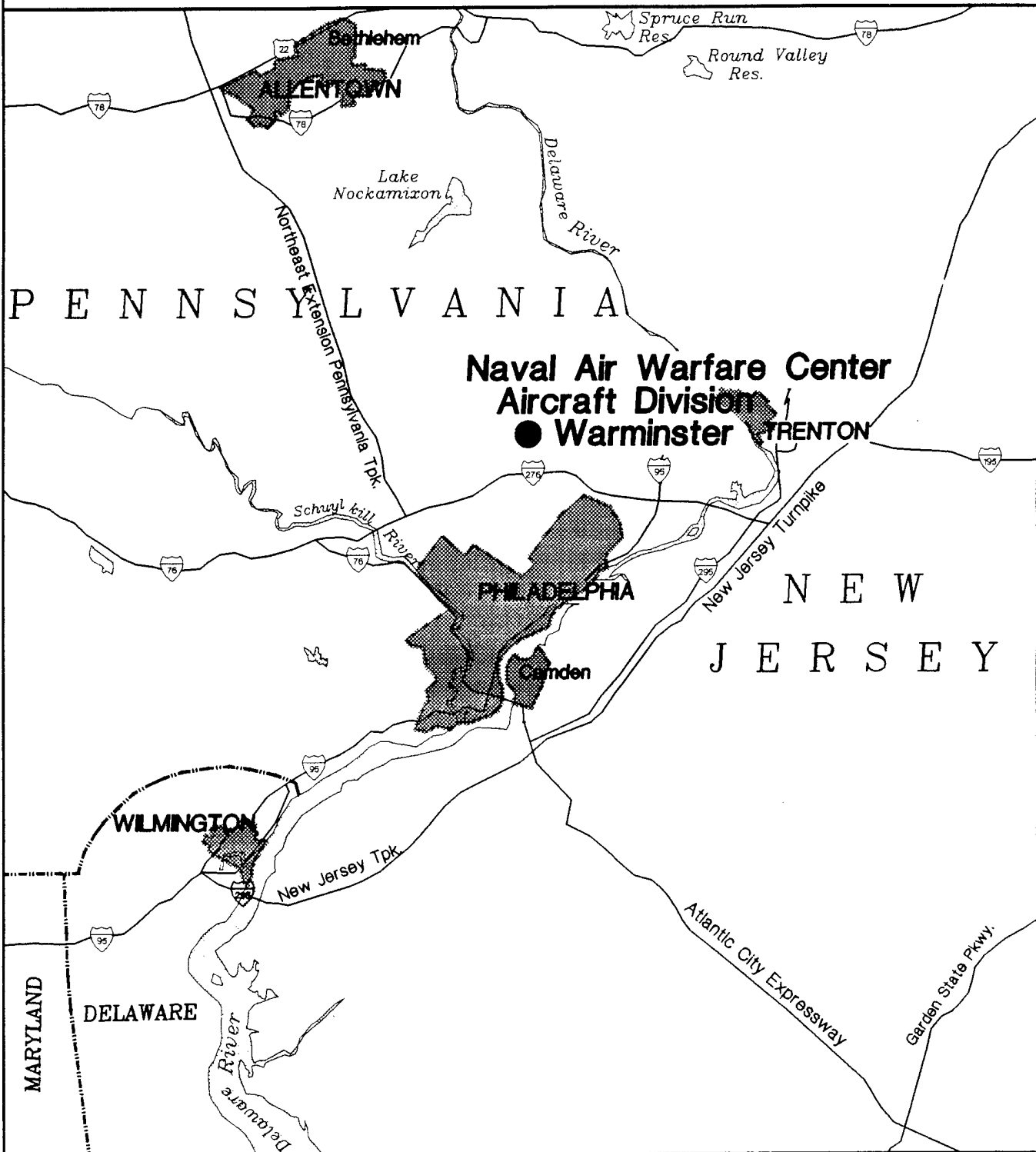
In 1991, the Base Closure and Realignment Commission determined that NAWCAD would be slated for a major realignment. The majority of the aircraft systems RDT&E would be relocated to the Naval Air Warfare Center Aircraft Division Patuxent River, Maryland. A few specialized, immovable facilities would remain at NAWCAD. The dynamic flight simulator and the RDT&E Division would remain, and the Oreland Open Water Facility would remain government property under NAWCAD Patuxent River. Military family housing would be retained. All other tenant commands would be disestablished or relocated off the site.

1.1.2 Base Closure and Realignment Commission Decision 1995

The future of NAWCAD was further impacted in March 1995. The Base Closure and Realignment Commission recommended that several facilities at NAWCAD that were to be retained by the Navy under the BRAC 91 realignment, be closed and excessed. These properties are as follows:

- **Bldg 108** - This building is the inertial laboratory, situated on 31 acres (13 hectares) in the south central section of the base;
- **Bldgs 70 and 72** - These buildings are associated with the dynamic flight simulator and occupy three acres (one hectare) at the extreme west of the base; and
- **Bldgs 125 and 138** - These buildings occupy 12 acres (5 hectares) and are essentially extensions of the main complex of Bldgs 1, 2, and 3 west of Jacksonville Road.

Site Location



Base Location



Urban Area



Interstate Highway



US Highway

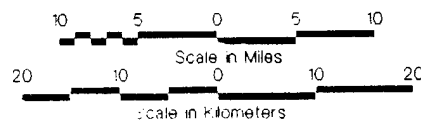


Figure 1-1

The military family housing would be retained by the Navy and transferred to the Naval Air Station Joint Reserve Basin Willow Grove (NASJRBWG).

1.2 Disposal Procedures

The federal government has formal procedures for disposing of its property. Under the specific conditions of the Base Closure and Realignment Act, the Navy acts as the disposal agency and follows these procedures or screenings:

- First, the Navy offers the property to other DoD agencies and to the Coast Guard;
- If these agencies have no interest, the Navy offers the property to other federal agencies;
- The property is also advertised for use by agencies serving the homeless, either under the Stewart B. McKinney Assistance Act of 1987 or in accordance with the Base Closure Community Redevelopment and Homeless Assistance Act of 1994 (PL 103-421);
- The property is next offered for sale to state and local governmental bodies and governments of Indian Tribes. There are discounts, often 100 percent, on the cost, if the property is to be used for public benefit, such as for education, parks or recreation, or health-related facilities. Alternatively, property can be acquired through negotiated sale, economic development conveyance, or other authorized disposal methods under the BRAC legislation. If a property contains wetlands or is an historic site, the property may be conveyed with deed restrictions on its use to protect these resources;
- Should state or local governmental bodies or governments of Indian Tribes not want a property or parts of it, the Navy can offer the unwanted property for sale to the general public by competitive bid or auction.

The screening process for the disposal of NAWCAD has been completed. Since no other DoD agencies or other federal agencies expressed any interest in the properties, they were declared surplus to DoD.

The Reuse Plan (ERA, March 1995) cites nine proposals for the Redevelopment Act of 1994, involving use of facilities to provide help with housing, food, and other material assistance for homeless and low income persons, i.e., a group home residence for pregnant and parenting teen

mothers; a residence for five or six rehabilitated mentally ill persons; a medical center for maternal and child health programs. Three of the nine proposals have received Federal Lands Reuse Authority (FLRA) Board approval and are slated for review by the Department of Housing and Urban Development (HUD) (Bass, July 2, 1996). The three proposals are as follows:

- Bucks-Mont Center Human Services - requested Navy Exchange for food, bedding and clothing distribution;
- Bucks County Health Department - requested Dispensary for inoculations and medical testing;
- NGA, Inc. - requested old firehouse (Bldg 90) for new clothing distribution.

The Navy is working with Bucks County on reuse of NAWCAD property that may be acquired by the county and converted to the uses proposed in the county's proposed *Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania* (March 1995), which was prepared by the Bucks County Economic Adjustment Committee (EAC) and Base Reuse Subcommittee. The EAC was the former planning agency for the county. In 1995, Bucks County established the Federal Lands Reuse Authority (FLRA), which is empowered to carry out the business of redeveloping NAWCAD. The proposed Reuse Plan and its alternatives are the subject of this EIS and are described in detail in Chapter 2.

1.3 Public Involvement

On September 25, 1995, the Navy announced that it would prepare an EIS in accordance with NEPA to study the disposal and reuse of NAWCAD. On October 12, 1995, the Navy hosted a public scoping meeting at the Longstreth Elementary School in Warminster, Pennsylvania. The purpose of the meeting was to solicit public input to determine significant issues related to the proposed Reuse Plan that should be addressed in the EIS. At the public meeting, Navy personnel presented a briefing about the EIS process and the schedule for completing the study. A representative of the FLRA presented the proposed reuse plan for NAWCAD.

The following known areas of concern were identified:

- Contaminated sites on and surrounding NAWCAD should be cleaned up commensurate with proposed future use of the site;
- Reuse of NAWCAD should provide for ample recreation space;

- Impact of future NAWCAD reuse on stormwater in adjacent areas should be considered.

2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter provides an in-depth description of the proposed action and its alternatives. The regulations of the Council on Environmental Quality (CEQ) place significant importance on the discussion of alternatives to a proposed action. In fact, as defined in Section 1502.14, the analysis of alternatives is the heart of an EIS, the purpose of which is to provide a decision maker and the public with "sharply defined issues and a clear basis for choice among options." The CEQ regulations also direct that other reasonable alternatives to the proposed action must be evaluated in an EIS, even if these alternatives are not within the jurisdiction of the agency.

This EIS considers three action alternatives. The proposed action (preferred alternative) is the disposal and reuse of NAWCAD consistent with the proposed *Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania*, prepared by the Bucks County Economic Adjustment Committee and Base Reuse Subcommittee (now known as the Federal Lands Reuse Authority [FLRA] of Bucks County), March 1995, and described in Subchapter 2.3. Two other reasonable alternatives are also considered in this EIS: the Residential Alternative and the Aviation Alternative (although neither alternative presently has a sponsor). The proposed Reuse Plan and its alternatives represent three levels of development intensities and resulting impacts (i.e., the Residential Alternative being low; the Reuse Plan being medium, and the Aviation Alternative representing the highest intensity) that might occur with disposal and reuse of NAWCAD property.

The EIS also addresses the no action alternative, described in Subchapter 2.5.1. This alternative is defined as the closure of NAWCAD (except the officer family housing and enlisted family housing), and the relocation of all military activities. Only the operation of the Navy family housing complex with 199 family units for enlisted personnel and six family units for officers would continue and would be transferred to NASJRBWG.

2.1 NAWCAD Warminster

NAWCAD has served as the principal Navy RDT&E center for both naval aircraft systems and airborne and anti-submarine warfare systems. The site has a long military association beginning in 1941 when Brewster Aeronautical Corporation purchased 400 acres (162 hectares) to erect an aircraft assembly plant and industrial airport. Once operating, the plant was the largest in Pennsylvania and the sixth largest in the nation, and provided employment for 5,000 workers. Labor unrest and production inefficiencies led to a Navy take-over of the Warminster facility in May 1942. The facility was ultimately purchased by the federal government in 1944. After the war, the facility's mission was shifted from production to research and development, with a continued expansion of activities through the decades of the Cold War.

The 1991 Master Plan for NAWCAD indicated the following departments and assignments (US Navy, 1991):

- Commander, Naval Air Development Center;
- Technical Director;
- Chief Staff Officer;
- Computer Department;
- Antisubmarine Warfare Systems Department;
- Tactical Air Systems Department;
- Warfare Systems Analysis Department;
- Communication and Navigation Technology Department;
- Mission Avionics Technology Department;
- Air Vehicle and Crew Systems Technology Department;
- Systems and Software Technology Department;
- Engineering Support Group; and
- Test and Evaluation Department.

Also located at NAWCAD were nine tenant activities, not all affiliated with the Navy:

- Navy Publishing and Printing Service Branch Office;
- Officer-In-Charge, NAVFACENGCOM Contracts, East PA;
- Naval Hospital Branch Clinic;
- Personnel Support Detachment;
- Naval Investigative Service;
- NJROTC Area Manager, Area Four;
- Naval Audit Service;
- General Accounting Office; and
- US Small Business Administration.

NAWCAD loading in 1990 was a total of 3,605 personnel. Prior to the BRAC closure decision, NAWCAD base loading was expected to remain constant through 1996. However, since closure plans were announced, Navy functions at the base have been decreasing. As of the end of August 1995, permanent civilian personnel totaled 1,398 plus 132 military personnel. As of May 1996, civilian and military personnel total 1,107 and 22, respectively (Frederick, June 12, 1996).

The 1991 Master Plan identifies 214 buildings at NAWCAD accommodating approximately 1,791,000 sq ft (166,400 sq m) of space: 91 percent in permanent construction, eight percent in semi-permanent construction, and one percent in temporary construction.

The proposed action for this EIS consists of the disposal of NAWCAD by the Navy and reuse pursuant to the county Reuse Plan (ERA, 1995); this action is described in Subchapters 2.1 through 2.3.

The pattern of existing land use on the base is shown in Figure 3.1-2 (Land Use at NAWCAD) (presented in Subchapter 3.1). Activities are broadly categorized into six functions as follows:

- Research and Development - This includes the original aircraft factory Bldgs 1 and 2 (now combined into one large building), as well as Bldgs 70 (human centrifuge), 125, 138, 361 (ejection tower), 367, and the airflow facility near Bldgs 95.
- Airfield Operations - These facilities are located east of Jacksonville Road and include: hangar, air traffic control tower, fire/crash house, several smaller support buildings, and an 8,000-ft (2,440-m) runway with approximately 52,000 square yards (sq y) (43,477 sq m) of concrete surface apron area.
- Industrial - These facilities include Bldg 4, a hangar, and a group of small warehouses and shop buildings.
- Administration - Bldg 3 was the original 1942 two-story general office, which was soon supplemented by a three-story planning and drafting wing.
- Family Housing - Married officer housing consists of six single-family houses and Quarters "A" and "B" that are very old farm houses. Enlisted family quarters comprise 39 sets of quarters (Bldgs 401 - 440) accommodating 199 families. Housing assets are used not only by NAWCAD but also by the other units of the Navy's North Philadelphia Complex, the Aviation Supply Office (ASO) and NASJRBWG.
- Personnel Support - These facilities include the medical clinic (Bldg 16), unaccompanied enlisted personnel housing (Bldg 109) and a similar structure for the EM-CPO Club (Bldg 7), a group of recreational facilities (Bldgs 99 and 349), and two Navy Exchange buildings, one near the hangar and the other near the family housing.

2.2 Community Reuse Plan Planning Process

This discussion on the reuse planning process for NAWCAD is based extensively on the *Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania* (ERA, 1995).

2.2.1 County Development Goals and Objectives

Planning Process

The planning process covered a period of seven months prior to the publication of the draft NAWCAD Reuse Plan. Key elements included interviews with local leaders, committee meetings, seminars, and a resident survey. In addition, four public meetings were held, two of which were general presentations and two on specialized topics (McKinney Act and environmental issues).

A number of concerns were identified through the community involvement process:

- Direct loss of NAWCAD jobs, many of them high-paying;
- Indirect loss of jobs to businesses that depend on serving the base and its employees;
- Lost tax revenues;
- Reduced property values (if many people leave the area, an oversupply of housing will result);
- Loss of military payments to local school districts;
- Loss of emergency management services provided by NAWCAD; and
- Loss of development in nearby towns if reuse at NAWCAD successfully attracts tenants.

Goals and Objectives

Several important goals related to reuse of NAWCAD were identified during the community involvement process. These goals, adopted by the FLRA, are primarily aimed at alleviating potential economic losses upon the closure of NAWCAD:

- Job losses at NAWCAD should be replaced or offset by the creation of new jobs;
- The nature of the NAWCAD workforce (highly-skilled and highly-paid) should be maintained;
- Displaced workers and contractors should be assisted in finding new jobs and sources of business in the Bucks County area;
- The area's economic stability should be maintained;
- Local tax bases should be preserved;
- The rural and middle class character of the area should be maintained; and
- Adverse impacts associated with reuse of the property (noise, traffic, and aesthetics) should be minimized.

2.2.2 Screening of Potential Reuses

A wide range of strengths and liabilities were identified for NAWCAD during the planning process that would readily facilitate the property's reuse. The more commonly mentioned assets were:

- Location - a major facility with lots of acreage in a growth area, recognized as having outstanding quality-of-life factors;
- Airfield and supporting facilities;
- Highly skilled workers who presently work at NAWCAD; and
- Facilities that lend themselves to a campus-style environment.

In contrast, the facility's liabilities, from a market perspective, were identified as:

- Base buildings that are too old and uncompetitive in today's market (e.g., Bldgs 1,2 and 3 do not lend themselves to being subdivided);
- Poor access: a new intersection, signalization, and roadway widening improvements would be required and the facility is too far away from Interstate 95;
- Cost of removing the existing 8,000-ft (2,440-m) runway is estimated at \$6 million;
- Potential environmental problems, or perceptions of them could scare prospective tenants; and
- The base is located in a residential area, which increases the probability of community opposition to various reuse alternatives.

Ideas for reuse of NAWCAD ranged widely and included:

- University branch/academic consortium;
- Multi-business complex
- Entertainment production center;
- Corporate campus or distribution center;
- Hi-tech office park;
- Research park;
- Aviation retrofitting and other aerospace business;
- Theme park or other specialized recreation park;
- Sports complex;
- Correctional facility;
- Recreational facilities (golf course, park, open space, etc.);
- Residential development;
- Hotel/conference center;
- Building trades center; and
- Navigational research center.

Office, industrial, recreational, and residential uses were all identified as potentially appropriate for the reuse of NAWCAD, particularly in the context of growth-oriented central Bucks County. While NAWCAD's airfield facilities were recognized as a potentially marketable asset, local residents indicated that any reuse plan that included heavy usage of the airfield would be likely to generate their vigorous opposition. The most commonly mentioned reuse activity was as a university branch campus; this was also the most favored idea in the community survey. Survey respondents listed most ideas as good or excellent, with the exceptions of airport development and an office park.

The reuse consultant team examined all potential reuse options in terms of the market and economic base, the existing NAWCAD facilities, and site conditions. (Existing environmental conditions in these environmental contexts are described in Chapter 3 of this EIS.) As reuse plan options were reviewed by the Base Reuse Committee and the planning consultant team, a series of mapped land use scenarios were concurrently developed, including differing approaches to providing access and roads. Rankings were prepared for each alternative with respect to: jobs created, tax revenues, fiscal considerations, open space and recreational opportunities, environmental impacts, potential for early action and successes, infrastructure requirements, and implementation. As the mapping of scenarios progressed, it became apparent how certain reuse options would affect other options. For example, maintaining the airfield with its clear zones, safety areas, and taxiways would conflict with and/or limit the location and operation of other potential uses deemed more suitable for the facility.

Also, according to the Reuse Plan report (ERA, 1995), Pennsylvania Department of Transportation (PENNDOT) capacity determinations for the surrounding roadway network (between 5,000 and 5,500 trips per day) restricted the amount of acreage that could be designated for traffic-generating activities.

Consideration of continued airfield uses at NAWCAD identified several drawbacks that resulted in elimination of this reuse option (ERA, 1995):

- First, adherence to Federal Aviation Administration (FAA) airfield operations requirements would have necessitated additional land for taxiways and potentially the partial demolition of Bldgs 1, 2, and 3 for a clear zone. This would eliminate a significant portion of the facility for other uses.
- Secondly, the costs associated with operating an airport at the site would have required an increase in the number of flight operations per year from 500 to at least 50,000 (ERA, 1995). Because no municipal or county government has indicated a willingness to subsidize any proposed airport, even with this increase in flight operations, the airport could run at an operating deficit.
- Finally, substantial community opposition to noise and other airport-related impacts was identified.

The use of the site as a major correctional facility was also eliminated on the basis of potential community opposition, despite the potential for creation of a large number of well-paying jobs under this option (ERA, 1995).

The decision to retain the main buildings at NAWCAD was key to ultimate development of the proposed action. This decision was closely tied to strong interest expressed by several universities, a medical school, and potential technology tenants to implement a business incubator within the space. Two scenarios, designated Option I and Option II, were developed by the planning consultants to reflect a mix of the activities proposed by the community, that were responsive to market demand, and that were built on sound planning principles:

- **Option I** - This option would involve a mix of uses, including the designation of the three large buildings (Bldgs 1,2, and 3) and surrounding land to business incubator, university, and medical adaptive reuse. A 150-acre (61-hectare) business and industrial park would be another key component. Based on a request from a regional developer, a 50-acre (20-hectare) congregate housing component was included. A corporate office complex, a 125-acre (51-hectare) university campus, and a small site for a hotel and conference activities were also included. About 20 percent of the base was designated for parks and open space.
- **Option II** - Under Option II, Bldgs 1,2, and 3 were also targeted for incubator, university, and medical uses. The business and industrial park is smaller at 100 acres (40 hectares), and a golf-residential development covers 250 (30 hectares) acres. The congregate housing component remains the same as Option I. An opportunity project area, potentially a sound stage, is allocated 75 acres (30 hectares). The parks and opens space component is reduced to 100 acres (40 hectares).

The planning consultants compared the two options using a variety of factors and the interrelationships among them (e.g., the number of jobs per unit of space). Another factor, public benefit conveyances, relates to the conveyance of federal properties to local development authorities at less than market prices if there is a public benefit, thereby having a potential impact on the financial feasibility of the proposed project. The factors identified in the Reuse Plan are summarized below:

- Jobs (number, type, and timing);
- Market demand (products, absorption, and site requirements);
- Fiscal impact (tax base revenues, other tax income, and public investment);
- Property conveyance (public benefit, land sales, lease revenues, and environmental constraints);
- Business management elements (income/revenue stream, maintenance/renovation, management, and caretaker impact):

- Government (public space needs, local incentives, infrastructure costs, Pennsylvania programs; and federal programs; and
- Bottom line (positive impacts vs. costs, and optional decisions).

As a result of the traffic parameters noted earlier, the differences between the two scenarios were not major. Infrastructure costs were the same and, although Option II had a slightly higher potential for property tax generation, the planning consultants and the Base Reuse Subcommittee reached consensus that Option I was slightly better overall. Refinements to Option I have emerged as the county-approved Reuse Plan.

2.3 Reuse Plan

The following is a summary of the Reuse Plan proposed by the FLRA as presented in *Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania* (ERA, 1995).

2.3.1 March 1995 FLRA Reuse Plan

The Reuse Plan was adopted by the Bucks County Commissioners in March 1995, and formally delivered to the Navy on April 14, 1995. Designed to be market-driven, the plan capitalizes on the site's assets, and seeks to minimize the impacts of site constraints. More intensive uses are concentrated in the vicinity of Street and Jacksonville roads, where the major transportation and other infrastructure exists. Less intensive land uses are located to the east, where concern for existing residential areas and parklands has resulted in the designation of additional parklands and other compatible uses.

The major elements of the Reuse Plan are:

- Multi-business complex and educational use of the Bldg 1, 2, 3 complex;
- New industrial/business/office R & D complex on the Jacksonville Road and Street Road frontages;
- Park and recreation uses;
- University/institutional land; and
- Major new spine road linking the site and providing new access points to the site.

In addition to these major elements, the Reuse Plan would provide other elements including the following:

- Senior congregate care site providing health care and living opportunities;
- Municipal lands for Warminster Township use;

- Residential lands in Ivyland Borough;
 - Hotel/conference center site; and
 - Additional lands for roadways and easements.
-

2.3.2 BRAC 1995

The BRAC 95 decisions described in Chapter 1 came after the Reuse Plan had been adopted, and affect several parcels at NAWCAD that were to be retained by the Navy under the BRAC 91 realignment. The FLRA has received US Office of Economic Adjustment planning grants to address these additional lands, as well as comprehensive base reuse concerns such as traffic, storm water management, utilities, and recreation. However, it appears that completion of these studies is not expected until December 1996 (Rockwell, January 5, 1996). In light of this potential delay and the fact that prospective users of the BRAC 95 properties are already being identified by the FLRA, the likely reuse of these BRAC 95 facilities is incorporated in this EIS.

The prospective reuses of the BRAC 95 properties are as follows:

- **Bldg 108 (Inertial Laboratory)** - The prospective user, Pennsylvania State University (Penn State), already has a research contract with the Navy that would continue here and potentially expand. Penn State anticipates expanding its personnel to about 100.
- **Bldgs 70 and 72 (Dynamic Flight Simulator)** - This facility will be privatized and sub-leased to VEDA, Inc. (Woods, August 7, 1996). A conservative estimate of 125 personnel is assumed for the impact analysis.
- **Bldgs 125 and 138 (University/Institutional)** - The buildings are the subject of recent interest by a consortium of eight universities. It is estimated that the facilities would be occupied by approximately 700 students and faculty.

The Navy will retain and transfer to NASJRBWG the 64 acres (26 hectares) accommodating the enlisted family housing, plus approximately three acres (one hectare) accommodating the six officer family housing units on Jacksonville Road.

2.3.3 Proposed Reuse Plan

The following is a summary of the proposed Reuse Plan that incorporates: 1) the March 1995 FLRA plan (ERA, 1995); 2) BRAC 95; and 3) assumptions regarding likely reuses based upon discussions with the FLRA (Rockwell, January 5 and March 25, 1996). This proposed plan is shown in Figure

2-1 (The Reuse Plan). The acreage and square footage presented for each land use component are based on approximate delineations and can be summarized as follows:

- Multi-Business Complex - Multi-business complex, R & D, and educational uses of the existing main complex (Bldgs 1, 2, and 3) west of Jacksonville Road totaling 46 acres (19 hectares). It is projected that 1.2 million sq ft (111,000 sq m) of useable building floor area (mechanical and stairway space is omitted) will be absorbed (ERA, 1995) supporting 2,400 jobs;
- Dynamic Flight Simulator - Bldgs 70 and 72 are associated with the existing dynamic flight simulator and occupy three acres (one hectare) at the extreme west of the base. It is projected that 72,000 sq ft (6,700 sq m) will support 125 jobs.
- University/Institutional - This would mostly be a new complex occupying 84 acres (34 hectares) and supporting projected employment of 400 with an estimated 2,000 students. It would be located toward the east end of the site with frontage on Bristol Road. Also included under university use is the proposed reuse of BRAC 95 relinquished Bldgs 125 and 138, west of Jacksonville Road, occupying 12 acres (34 hectares). (The combined acreage for the University/Institutional component of the Reuse Plan is therefore 96 acres [39 hectares]). These facilities would be occupied by approximately 700 students and faculty. In discussions with the FLRA (Rockwell, January 5 and March 25, 1996) concerning the BRAC 95 properties and the prospective reuse of these by the university consortium, the 84-acre (34-hectare) parcel allocated to university/institutional use may not be taken up within the appropriate time frame, and if alternate industrial uses emerged as viable projects, this land may be reassigned. As a result of this possibility, the impact analysis will include an alternate assumption of industrial use for this parcel, as a reasonable worse-case assumption, particularly for traffic and air quality assessments.
- Industrial/Business - This would be a new complex of 159 acres (64 hectares) immediately east of Jacksonville Road with frontage on Street Road. The stated intention is to develop industrial space supporting 2,850 jobs, and office space supporting 520 jobs (ERA, 1995); assuming a low space per employee ratio of 550 sq ft (51 sq m) per employee, the proposed employment implies 1,853,000 sq ft (172,000 sq m) of development.
- Hotel/Conference - This would be a new facility occupying 10 acres (4 hectares) adjacent to the Industrial and Business Park. This facility would also have frontage on Street Road at the location of the proposed major new access way into the redeveloped NAWCAD. This facility is projected to support 260 jobs. No specific estimate of the number of rooms is provided in the FLRA Reuse Plan report (ERA,

The Reuse Plan

Warwick

Northampton

Ivyland

Warminster

Upper
Southampton

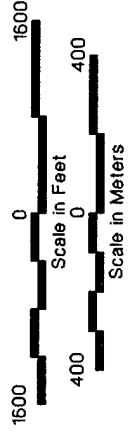
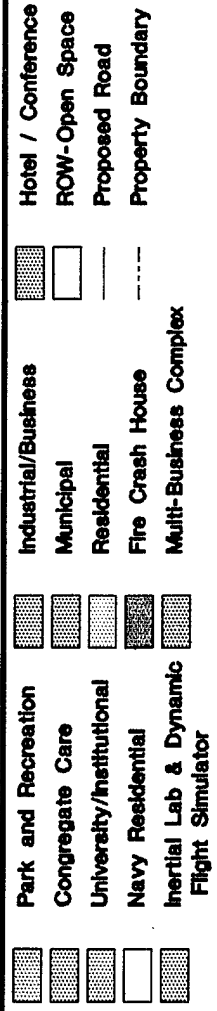
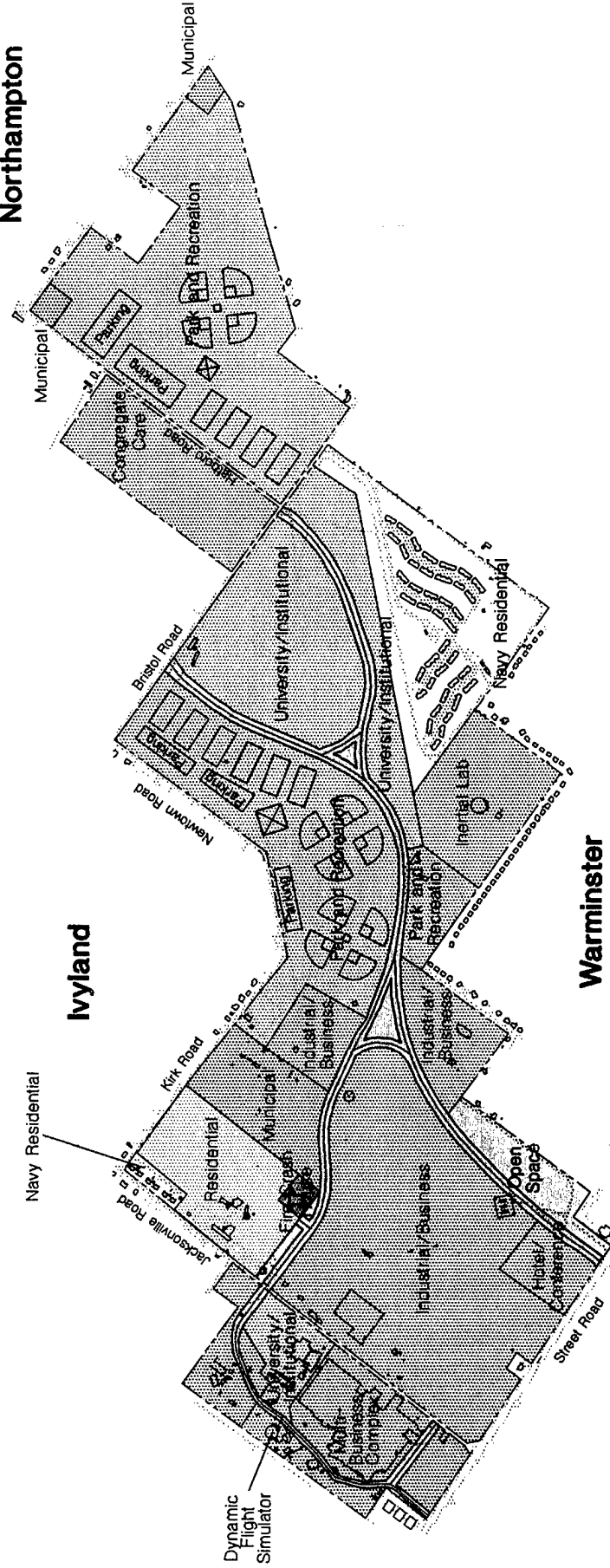


Figure 2-1

1995), however, the FLRA indicated that 100 rooms would be a reasonable estimate (Rockwell, March 25, 1996).

- Residential - This would be a new single-family residential complex of 34 acres (14 hectares) in Ivyland Borough. A development of 150 to 200 homes is projected (ERA, 1995). For the purposes of this document, 175 units are projected at densities of approximately five units per acre.
- Fire/Crash House - An existing facility located on two acres (one hectare) northeast of the hangar. At present, there are no firm plans for the facility, although the FLRA would like to see it remain in service, perhaps supported by a consortium of reuse businesses and institutions (Rockwell, January 5, 1996). For the purpose of this EIS, it is assumed that the facility will eventually be returned to service as a fire house.
- Municipal Uses - 30 acres (12 hectares) are set aside for municipal uses. Of the 30 acres (12 hectares), 24 acres (10 hectares) are in Warminster Township. No indication of proposed use of is given, however, conversations with Township and FLRA officials indicate that this is presently intended for parking of school and municipal vehicles. A modification of the Town of Northampton's recreational proposal provides for two three-acre (one-hectare) sites to provide a new fire house and a new water well and pump; these would be located on New Road at the eastern border of NAWCAD.
- Congregate Care - This would be a new facility for senior-living occupying 38 acres (15 hectares) in Northampton, fronting on Bristol and Hatboro Roads. The number of jobs associated with this facility is 800 (ERA, 1995) and the FLRA indicated that a development of 250,000 sq ft (23,225 sq m) is sought. At this time, there is no specific plan indicating the proposed program of long-term care, assisted-living, etc. However, assuming a ratio of 500 gross sq ft (46 sq m) per person implies that there would be 500 residents.
- Inertial Laboratory - The existing inertial laboratory at Bldg 108. It is situated on 31 acres (13 hectares) in the south central section of the base. The prospective user, Penn State anticipates about 100 personnel (Rockwell, January 5, 1996).
- Parks and Recreation - Parkland and open space buffers are proposed for 122 acres (49 hectares) in Warminster and 124 acres (50 hectares) in Northampton for a total of 246 acres (100 hectares). Roughly 20 to 30 jobs have been associated with this land use (ERA, 1995).

- Right-of-Way (ROW) and Open Space - Key land use elements of the Reuse Plan would be tied together by a proposed new internal system and a series of "gateway" design elements occupying 62 acres (25 hectares).

The main complex of 64 acres (26 hectares) accommodating 199 enlisted family housing units and the six officer family housing units comprising three acres (one hectare) on Jacksonville Road (total of 67 acres [27 hectares] of Navy Housing) would be retained for Navy families serving NASJRBWG.

The approximate acreage associated with the Reuse Plan assumptions is summarized in Table 2-1. Preliminary cost estimates for infrastructure associated with the reuse plan are presented in Table 2-2.

On the basis of anticipated market demand and the limiting factor of traffic capacity on the highway network proximate to the site, the Reuse Plan anticipates that approximately 7,600 jobs can be generated at the base, over a build period of 15 years.

2.3.4 Redevelopment Act of 1994 Proposals

The Reuse Plan (ERA, March 1995) cites nine proposals for the Redevelopment Act of 1994, involving use of facilities to provide help with housing, food, and other material assistance for homeless and low income persons, i.e., a group home residence for pregnant and parenting teen mothers; a residence for five or six rehabilitated mentally ill persons; a medical center for maternal and child health programs. Three of the nine proposals have received Federal Lands Reuse Authority (FLRA) Board approval and are slated for review by HUD (Bass, July 2, 1996). The three proposals are as follows:

- Bucks-Mont Center Human Services - requested Navy Exchange for food, bedding and clothing distribution;
 - Bucks County Health Department - requested Dispensary for inoculations and medical testing;
 - NGA, Inc. - requested old firehouse (Bldg 90) for new clothing distribution.
-

2.4 Reuse Plan Implementation

To implement the Reuse Plan, Bucks County established the FLRA in early 1995. The FLRA is empowered to carry out the business of redeveloping NAWCAD, including management, leasing, property improvements, and future planning. The FLRA's mandate is to execute the conversion

Table 2-1

Reuse Plan Land Use Program

Use	Land Acreage			Estimated Square Feet of Development (Square Meters)
	Acres	Hectares	Percent of Total	
Multi-Business Complex	46	19	6	1,200,000 (111,000)
Dynamic Flight Simulator (BRAC 95)	3	1	<1	72,000 (6,700)
University/Institutional West of Jacksonville Road (BRAC 95) East of Jacksonville Road Subtotal	12 84 96	5 34 39	12	1,600,000 (15,000)
Industrial/Business	159	64	19	1,850,000 (172,000)
Hotel/Conference	10	4	1	50,000 (5,000)
Residential Navy (retained) New (150 - 200 units) Subtotal	67 34 101	27 14 41	12	n/a
Fire/Crash House	2	1	<1	n/a
Municipal	30	12	4	n/a
Congregate Care	38	15	5	250,000 (23,000)
Inertial Lab	31	13	4	25,000 (2,300)
Park and Recreation	246	100	30	n/a
ROW-Open Space	62	25	8	n/a
Total	824	333	100	
<p>Notes: Land use acreage and amount of development are approximate based on estimates for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions. n/a = square feet not appropriate measure of development.</p> <p>Source: Based on Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995; and incorporating assumptions of BRAC 95 property reuse based on interviews with staff of the Federal Lands Reuse Authority of Bucks County, January 1996.</p>				

Table 2-2

Infrastructure Cost Estimates (Order of Magnitude)

Item		Cost
Roadways (25,000 Linear Feet x 400 Linear Feet)		\$10,000,000
Traffic Signalization		\$1,500,000
Jacksonville/Street Roads	\$500,000	
Street Road/New Entrance South	\$250,000	
Bristol/New Roads (2)	\$200,000	
Jacksonville/Kirk Road	\$100,000	
Bristol/Jacksonville Roads	\$250,000	
Bristol/Davisville Roads	\$100,000	
Jacksonville/Almshouse Roads	\$100,000	
Wastewater Line Upgrade		\$1,400,000
Water System Line Upgrade		\$500,000
Runway Demolition		\$6,200,000
Concrete Removal	\$2,800,000	
Pavement Removal	\$3,400,000	
Gateway/Entrance Features (4)		\$1,600,000
Total		\$21,200,000
Notes: 1) Off-site road improvements are not included and require additional study and PENNDOT coordination; 2) Does not include any improvement costs, if any, associated with BRAC 95 . Source: Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995.		

process, utilizing all appropriate resources and techniques. These may include: financing through grant applications and private funding; marketing through coordination with other regional and state programs, as well as targeting and follow-up of opportunities; development through property acquisition, surveys, planning, and construction; and general management. The intent is for the authority to achieve its development objectives, transfer all the property to private or municipal ownership, and then phase itself out of existence.

The Reuse Plan identifies a variety of actions that must be taken by the FLRA over the next five years. These actions are broadly characterized as management actions, marketing actions, development actions, and financing actions.

The Reuse Plan anticipates that property at NAWCAD will be conveyed through public benefit conveyances and public bid sale. Public benefit conveyances are to be requested for:

- Bldgs 1, 2, 3 - for a 100 percent economic development conveyance, with the title conveyed when the building can generate cash flow or a private owner is found.
- Congregate Senior Care (Northampton Township) - for economic development (jobs).
- Business Park - for economic development with a phased title transfer that coincides with market demand and environmental clean-up (this area would be a top priority for clean-up).
- University campus - for an educational public benefit conveyance.
- Recreation - Warminster and Northampton Townships seek public benefit transfer through the US Department of Interior.

The Ivyland residential and Warminster municipal sites would be either bid or conveyed through a negotiated sale.

2.5 Alternatives to be Considered Under NEPA

The proposed Reuse Plan is the preferred alternative for this EIS. However, pursuant to NEPA and the regulations of the CEQ, an EIS must consider other reasonable alternatives to the preferred alternative and no action alternative. Therefore, two alternative plans, the Residential Alternative and the Aviation Alternative are presented herein. In both cases, the portion of the base west of Jacksonville Road would be used as in the proposed Reuse Plan. The Reuse Plan and its alternatives represent three levels of development intensities and resulting impacts (i.e., the Residential Alternative

being low; the Reuse Plan being medium, and the Aviation Alternative representing the highest intensity) that might occur with disposal and reuse of NAWCAD property.

2.5.1 No Action Alternative

The EIS includes the no action alternative defined as follows: NAWCAD is closed, all military activities are relocated and the land is not disposed - it remains as federal government land. Continued government ownership of the property would have no benefit to the Navy as the Navy would incur continued liability for an asset with no functional, operational, or strategic value and violate federal property management regulations. Continued federal government ownership would also have no benefit for the local community since such ownership would prevent the possibility of viable and productive use of the land.

In applying the provisions of NEPA to the BRAC legislative process, the Secretary of Defense and secretaries of the military department concerned do not have to consider the following concepts (PL 101-510--November 5, 1993):

- The need for closing or realigning the military installation recommended for closure or realignment by the Base Closure Commission;
- The need for transferring functions to any military installation which has been selected as the receiving installation; and
- Military installation alternatives to those recommended or selected.

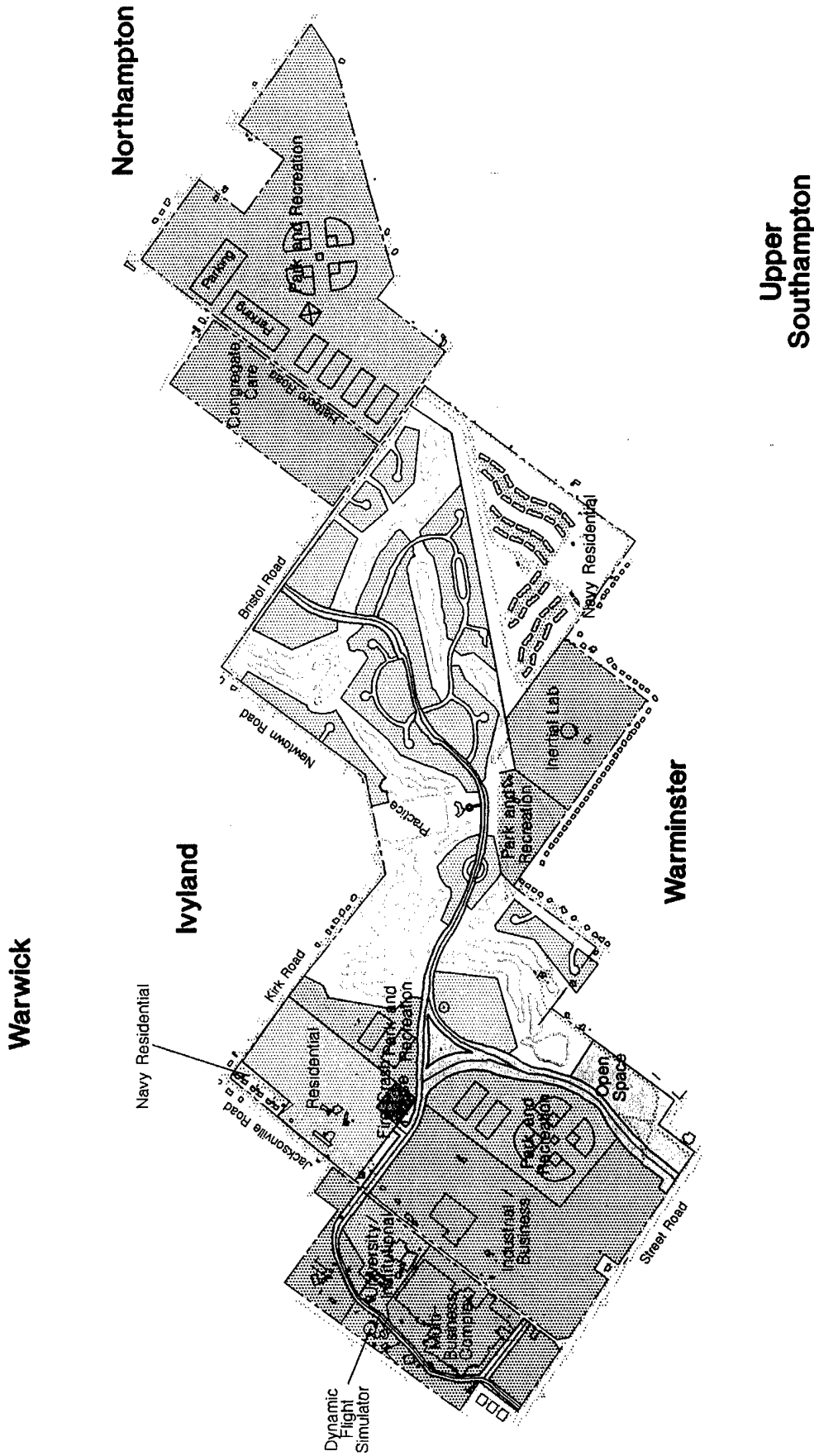
Consequently, for the purposes of this EIS, the no action alternative is presented and developed as the future baseline condition against which the impacts of the proposed action are measured.

2.5.2 Residential Alternative

Under this alternative the mostly undeveloped airfield east of Jacksonville Road would be developed primarily for residential uses plus appropriate local recreational facilities (Figure 2-2, Residential Alternative). The alternative largely follows the Reuse Plan's Option II (see Section 2.1.2) that was ultimately rejected in favor of Option I and its refinements, which became the Reuse Plan.

The residential alternative is different from the Reuse Plan because it incorporates a 250-acre (101-hectare) golf/residential component which adds 400 dwelling units. This addition of 400 units to the 150 to 200 units on the Ivyland site (as described for the Reuse Plan) would result in a total of approximately 575 new dwelling units (these would be in addition to the congregate housing, plus

Residential Alternative



any McKinney housing proposed for existing Quarters A and B). Table 2-3 provides key data on the land use program for the Residential Alternative. This alternative has no sponsor.

The Residential Alternative examined here incorporates the following components in relation to the Reuse Plan:

- The multi-business complex concept is maintained for the existing buildings on the 46 acres (19 hectares) west of Jacksonville Road, but the scale of the industrial/business park is reduced to 65 acres (26 hectares) (would utilize the existing hangar and would be located on the eastern frontage of Jacksonville Road and the north side of Street Road);
- University/educational use would be limited to the 12 acres (five hectares) associated with Bldgs 125 and 138;
- The congregate care and recreational uses in Northampton Township would be the same as in the Reuse Plan; and
- The residential use in Ivyland would also be the same as in the Reuse Plan.

2.5.3 Aviation Alternative

Feasibility of Civilian Aviation Reuse

An analysis of the for potential civil aviation use of the NAWCAD site was undertaken via a series of interviews and the evaluation of regional aviation factors. An inventory of existing and projected demand and capacity for commercial passenger, freight/cargo activity and general aviation services in the area surrounding the site was conducted. Baseline conditions were established from data gathered from federal, state and local governments. Users (airlines) of these facilities and fixed base operators (FBOs) were also contacted. These agencies and companies were interviewed and were asked to verify or supplement the database with demand/capacity information.

Both the available data and interviews indicated that good commercial air passenger service is available. Although similar comments were provided about air cargo service, several of the smaller firms stated that the NAWCAD site could offer an attractive alternative for shipments of their finished goods and/or raw materials in lieu of using Philadelphia International Airport. Aviation services are available to these companies at smaller general aviation airports in the area (i.e., charter passenger

Table 2-3
Residential Alternative Land Use Program

Use	Land Acreage			Estimated Square Feet of Development (Square Meters)
	Acres	Hectares	Percent of Total	
Multi-Business Complex	46	19	6	1,372,000 (128,000)
Dynamic Flight Simulator	3	1	<1	72,000 (6,700)
University/Institutional (existing buildings)	12	5	1	14,000 (1,300)
Industrial/Business	65	26	8	636,000 (59,000)
Residential				
Navy (retained)	67	27		
New (175 new units)	34	14		
Golf/Residential (400 new units)	250	101		
Subtotal (575 new units)	351	142	43	n/a
Congregate Care	38	15	5	250,000 (23,000)
Inertial Lab	31	13	4	25,000 (2,300)
Park and Recreation	210	85	25	n/a
ROW-Open Space	68	28	8	n/a
Total	824	333	100	n/a
<p>Notes: Land use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions. n/a = square feet not appropriate measure of development.</p> <p>Source: Based on Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995; and incorporating assumptions of BRAC 95 property reuse based on interviews with staff of the Federal Lands Reuse Authority of Bucks County, January 1996.</p>				

service, on-demand or unscheduled shipment of goods/parts, etc.). These services are used to some extent, but not extensively.

A system-oriented view was taken regarding eight airports closest to the NAWCAD site in order to gauge potential demand for activity at Warminster. Because of the existence of adequate facilities at commercial airports in the region, little potential demand for commercial passenger or scheduled air cargo service appears to be warranted. However, from this review, demand was determined to exist for additional facilities for accommodating general aviation aircraft in the area. Interviews with fixed base operators and airport managers revealed that many pilots are on waiting lists to either hangar or tie down their planes. Two regional air carrier facilities, Northeast Philadelphia and Philadelphia International, are currently operating at 79 percent and 77 percent of their annual service volumes, or capacity levels, respectively.

There is available airspace capacity at key municipal airports but there are several other important privately-owned, public-use airports in the vicinity that may be closing soon due to development pressures that will affect the capacity of other nearby airports. More important in the short term is the issue of storage capacity (i.e., the availability for tying down or hangaring an aircraft). These eight closest airports are projected to experience a major increase in the number of their based aircraft over the next several years. Pennridge, Buehl Field, and Wings Field are airports that are projected to experience the greatest growth in based aircraft in the region, with increases of approximately 55 percent, 39 percent and 38 percent, respectively, between 1994 and 2020. The ability of these airports to accommodate this growth will fall far short of meeting the demand for storage space.

Based on this research, there is potential for general aviation activity at Warminster and possibly some limited non-scheduled air cargo operations (i.e., aircraft hired to pickup or deliver items on a periodic basis). Accordingly, a forecast of general aviation (GA) activity with some limited non-scheduled air "cargo" flights was prepared for the Warminster site using 1994 as the base year, 2000 as the short-term projection, and 2010 as the planning horizon. These forecast levels assume similar operations per based aircraft as those identified for nearby airports of the same FAA classification.

A range of forecast-based aircraft and operations per based aircraft was used to determine forecast operations for the Year 2000 and the Year 2010. Forecast-based aircraft ranges were prepared for high, mid and low ranges. Table 2-4 presents the high, mid and low ranges of the number of based aircraft that could be expected at the Warminster site in the years 2000 and 2010.

Converting based aircraft to aircraft operations, three activity ranges were also assumed. These are medium business use, low business use, and occasional use. Table 2-5 and Table 2-6 present the forecasts for the three operational scenarios for the Year 2000 and the year 2010, respectively.

Another important part of the system-oriented evaluation regards the general framework that the Warminster site would fit into. There are several important airspace factors to be noted. There is a good likelihood for airspace conflict during all-weather/Instrument Flight Rules (IFR) conditions

Table 2-4
Range of the Number of Forecast-Based Aircraft in 2000 and 2010

Aircraft Type	2000			2010		
	Number of Aircraft			Number of Aircraft		
	High	Mid	Low	High	Mid	Low
Single-Engine	357	143	86	391	156	94
Multi-Engine	30	12	7	33	13	8
Turboprop	6	0	0	7	0	0
TOTALS	393	155	93	431	169	102

Table 2-5
Year 2000 Forecast General Aviation and Light Air Cargo Operations

AC Type	Medium Business Use			Low Business Use			Occasional Use		
	Total	Day	Night	Total	Day	Night	Total	Day	Night
Single-Engine	178,500	176,700	1,800	39,300	38,900	400	17,200	17,050	150
Multi-Engine	15,000	14,800	200	2,900	2,850	50	1,300	1,300	0
Turboprop	3,000	2,400	600	400	300	100	100	100	0
TOTALS	196,500	193,900	2,600	42,600	42,050	550	18,600	18,450	150

Table 2-6
Year 2010 Forecast General Aviation and Light Air Cargo Operations

AC Type	Medium Business Use			Low Business Use			Occasional Use		
	Total	Day	Night	Total	Day	Night	Total	Day	Night
Single-Engine	195,500	193,500	2,000	42,900	42,450	450	18,800	18,600	200
Multi-Engine	16,500	16,300	200	3,000	2,950	50	1,400	1,400	0
Turboprop	3,500	2,800	700	600	500	100	200	150	50
TOTALS	215,500	212,600	2,900	46,500	45,900	600	20,400	20,150	250

with the Northeast Philadelphia and Trenton-Mercer Airports, if Warminster had any type of instrument approach. The primary reason for this is that a portion (holding pattern) of the IFR-reserved airspace for these two existing airports' instrument approaches overlap. To introduce a third airport into this airspace with an additional instrument approach would mean more aircraft in this area.

Naval Air Station Joint Reserve Basin Willow Grove (NASJRBWG) is located approximately four mi (six km) west of the NAWCAD site. This area has major Visual Flight Rules (VFR) activity and reports, as well as interviews, verified that concerns exist now regarding VFR aircraft entering Willow Grove's Class D airspace. Airspace conflicts and the complexity of integrating operations at the NAWCAD site could lead to traffic delays at the NASJRBWG, particularly during IFR operations.

In all likelihood, these airspace considerations would limit any activity at Warminster to easterly approaches and arrivals only and not make it a candidate for any type of approach for use in poor visibility conditions. This constraint would reduce the attractiveness of the airport to a wide variety of activity, which accounts for the based forecasts not including any schedule activity (passenger or air cargo) or the basing of any type of aircraft other than piston-engines.

Another important consideration is the willingness of a local sponsor to own and operate the facility. No apparent willingness has been expressed by local governments to operate Warminster. In view of the airspace constraints which limits the growth potential, there may not be any local support that could develop.

Therefore in summary, an aviation demand for general aviation and some non-scheduled light air cargo activity has been identified. However, several key concerns also have been identified such as:

- Airspace constraints;
- Lack of potential for providing the capability to operate the airport in less than visual conditions; operations confined to arrivals from and departures to the east; and, no apparent interest expressed by local municipalities to own and operate airport.

A detailed discussion of the methodology used to evaluate the existing demand and capacity for the aviation use of the NAWCAD-Warminster site is included in Appendix B.

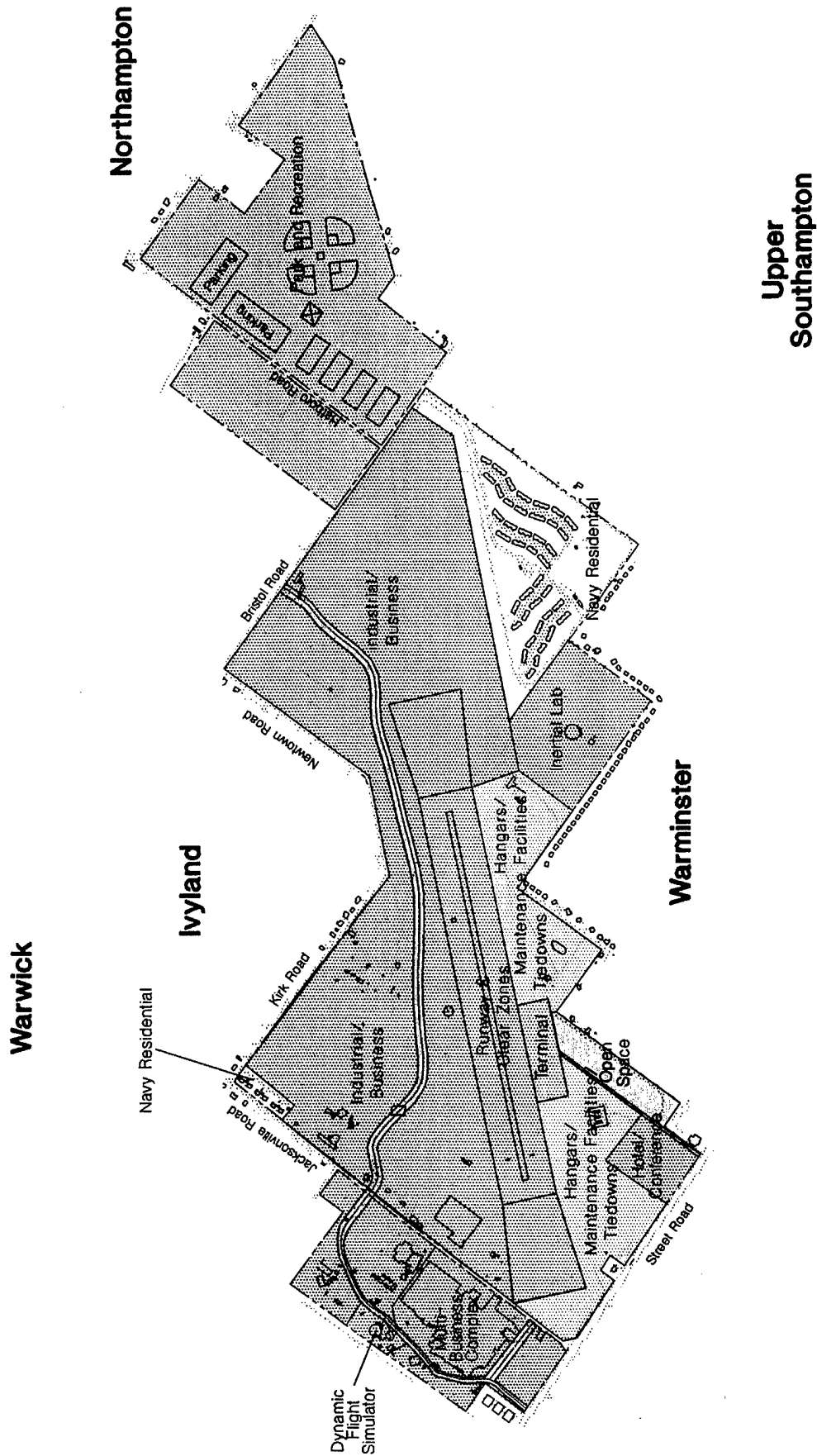
Other Components of Aviation Alternative

The aviation activities for this Basic Utility General Aviation (GA) airport, with its shortened runway, are projected to require 168 acres (68 hectares), or 20 percent of the 824 acres (333 hectares) at NAWCAD. The remainder of the land is allocated to uses considered compatible with a GA airport (Figure 2-3, Aviation Alternative). Table 2-7 provides key data on the land use program for the

Table 2-7
Aviation Alternative Land Use Program

Use	Land Acreage			Estimated Square Feet of Development (Square Meters)
	Acres	Hectares	Percent of Total	
Multi-Business Complex	46	19	5	1,372,000 (128,000)
Dynamic Flight Simulator	3	1	<1	72,000 (6,700)
Industrial/Business	284	115	34	4,900,000 (59,000)
Hotel/Conference	10	4	1	50,000 (5,000)
Aviation				
Runways & Clear Zones	84	34		
Hangars/Maintenance Facilities Tiedowns	77	31		
Terminal	7	3		
Subtotal	168	68	20	n/a
Residential (Existing Navy)	67	27	8	n/a
Inertial Lab	31	13	4	25,000 (2,300)
Park and Recreation	162	66	20	n/a
ROW-Open Space	53	21	6	n/a
Total	824	333	100	
<p>Notes: Land Use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions. n/a = square feet not appropriate measure of development.</p> <p>Source: Based, in part, on Reuse Plan, Naval Air Warfare Center, Bucks County, PA, March 1995; and incorporating assumptions of BRAC 95 property reuse based on interviews with staff of the Federal Lands Reuse Authority of Bucks County, January 1996.</p>				

Aviation Alternative



Aviation Alternative. In part, the proposed uses under the Aviation Alternative are identical with the Reuse Plan but other elements are moved, expanded, or eliminated:

- The multi-business complex proposed for existing buildings west of Jacksonville Road and the Inertial Laboratory would remain as proposed in the Reuse Plan. Similarly, the Hotel/Conference center on ten acres (four hectares) would remain on Street Road.
- The residential activity proposed for Ivyland and the congregate care facility in Northampton are eliminated because of potential conflicts with aviation use.
- The Industrial/Business park is expanded to encompass 284 acres (115 hectares) or approximately 34 percent of the total NAWCAD acreage; this expanded area displaces the residential, municipal, and university/institutional components of the Reuse Plan, as well as part of the parkland.
- Parkland would be limited to the area east of Bristol Road and would be extended to include the land allocated to the congregate care facility in the Reuse Plan.

The aggregate character of the Aviation Alternative is a more intensive industrial, research and aviation mix than the other alternatives. Employment at full build-out is projected to be 9,185, compared to 7,595 in the Reuse Plan and 5,042 in the Residential Alternative. It should be emphasized that the Aviation Alternative has no sponsor nor is it considered to be feasible by the FLRA.

Disposal and Reuse

Description of the

2-24

Proposed Action

3 AFFECTED ENVIRONMENT

The Council on Environmental Quality's regulations implementing NEPA (40 CFR Part 1500) state that an "environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration" and that "impacts shall be discussed in proportion to their significance." Significance as used in NEPA requires the dual considerations of context and intensity. With respect to context, "the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality." Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole.

This chapter describes the existing baseline conditions of the area in the vicinity of NAWCAD that may be directly or indirectly affected by the proposed action. The infrastructure, cultural resources, natural resources, and hazardous waste components of this EIS are described for the area within the NAWCAD site boundaries. The study area selected for the land use, socioeconomics, community services, traffic, air quality, and noise components comprises a one-mi (1.6-km) radius of NAWCAD (Figure 3.1-1, Study Area Boundaries).

3.1 Land Use and Zoning

The study area is positioned wholly or partly within the following Bucks County municipalities:

- Ivyland Borough;
- Northampton Township;
- Upper Southampton Township;
- Warminster Township; and
- Warwick Township.

3.1.1 Land Use

On-Site Land Use

The land use pattern at NAWCAD reflects its 54-year history as an aircraft development center. The 824-acre (333-hectare) facility may be broadly categorized into several distinct land uses: operations, administrative, housing, community facilities, maintenance, research, and conservation/buffer. The land uses at NAWCAD are shown in Figure 3.1-2 (Land Use at NAWCAD). Located on the NAWCAD property west of Jacksonville Road is a district cluster of industrial and research buildings

representing the original Brewster Aeronautical Corporation's facilities acquired by the Navy in 1944. These facilities have been altered and expanded upon since that time.

East of Jacksonville Road, aviation uses occupy the largest portion of the property. In this area is the 8,000-ft (2,400-m) runway and its aircraft parking aprons, hangar, tower, fire/crash house, several smaller support buildings, and aviation easement area at the east end of the runway. South of the runway is a separate facility for inertial guidance research and development. To the east is an area of 199 Navy family housing units for enlisted personnel. There are also eight housing units for officers, six of which are located along Jacksonville Road. Quarters for unaccompanied personnel, recreational facilities, and several other administrative support buildings are located north of the runway and east of Jacksonville Road.

Off-Site Land Use

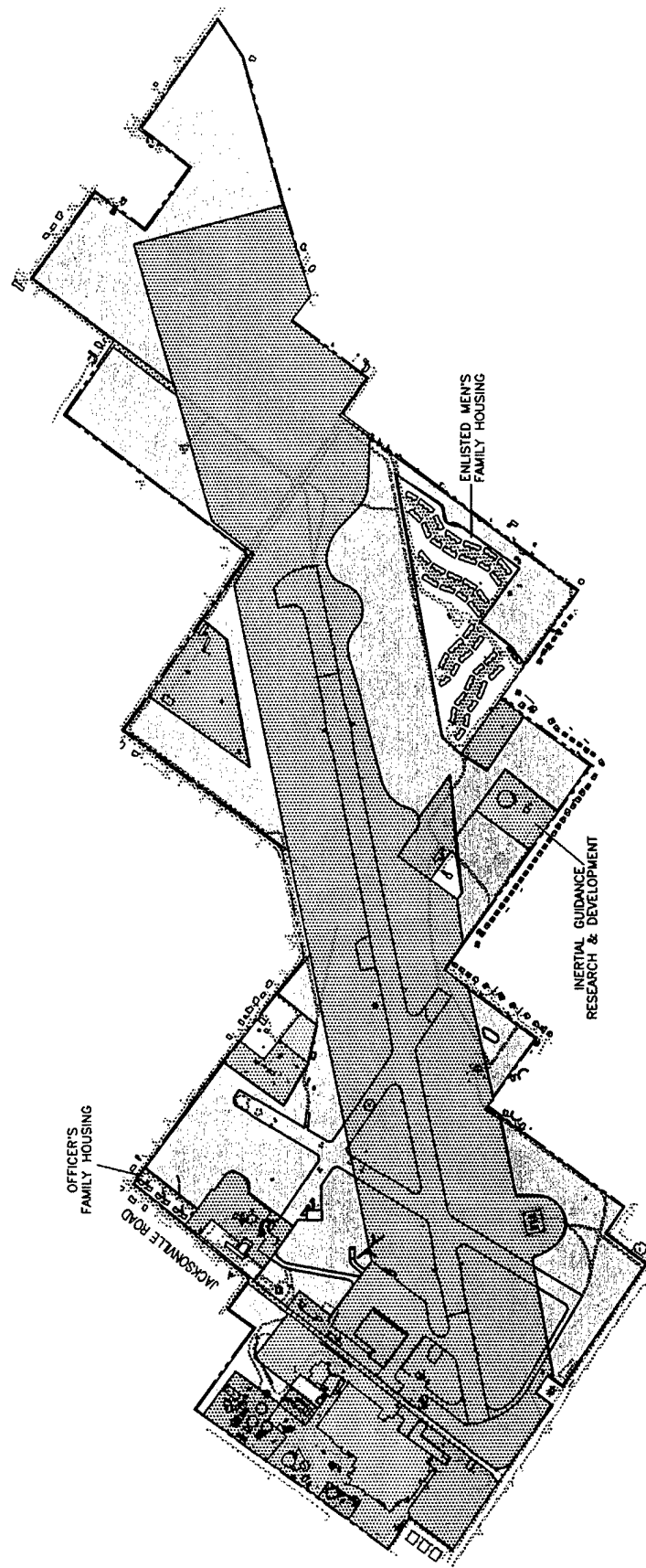
The land use pattern in this section of Bucks County is largely the result of suburban outgrowth from the city of Philadelphia. The area to the south, west, and northwest of NAWCAD was mostly developed during the 1960s and 1970s. In fact, the developed southern portion of the county has only limited opportunities for further in-fill development. The northern part of the county is still mostly agricultural and rural residential. The study area location is at the transition zone between suburban Philadelphia and the rural setting of upper Bucks County. Consequently, the area northeast of NAWCAD is presently at the cutting edge of suburban growth. Most of this development is medium- to large-lot single-family residential subdivisions in Northampton Township. Much of the vacant and agricultural land in the study area is likely to be absorbed by development as sewer and water services are extended by the township.

Existing land use patterns for the area immediately surrounding NAWCAD Warminster are shown in Figure 3.1-3 (Land Use Surrounding NAWCAD). This figure is derived from the 1990 existing land use map published by the Bucks County Planning Commission. NAWCAD itself is characterized as a Governmental Institutional use. Additional institutional uses (presented in more detail in Section 3.3, Community Facilities) include the Steve Szymanek Park, located across from NAWCAD on Street Road, and the William Tennent High School and Everett McDonald Elementary School to the southwest of NAWCAD. Near the high school is the Bucks County Hospital, and further west, the St. John Bosco parochial school. To the northwest of NAWCAD, partly within the study area, is another cluster of private schools, including the Archbishop Wood High School and the Nativity School. Longstreth School is a public elementary school a little to the northeast of the parochial school cluster. Two small municipal parks are located adjacent to NAWCAD in the north: Munro Park and Fitch Park.

A strip of commercial, manufacturing, transportation, and utilities uses is located to the west and north of NAWCAD, roughly parallel to the SEPTA railway line. Old York Road and Street Road are the primary commercial thoroughfares in the study area. Numerous small shopping centers, fast-food restaurants, and automobile-oriented businesses characterize these highways.

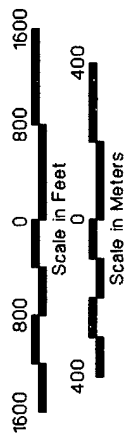
Bourne USCG, 1981

Land Use at NAWCAD



- Property Boundary
- [Pattern] Conservation/Buffer
- [Pattern] Housing
- [Pattern] Operations

- [Pattern] Administration
- [Pattern] Community Facilities/Medical
- [Pattern] Maintenance/Production/Storage/Supply/Utilities
- [Pattern] Research



Source: US Navy, 1991.

Figure 3.1-2

The map shows the Warminster area in Bucks County, Pennsylvania. The city limits are outlined in a thick black line. Major roads are shown with their respective route numbers in circles: 332, 263, 132, and 200. The map includes labels for surrounding municipalities: Northampton to the north, Upper Merion to the northeast, Southampton to the east, Warminster Heights to the south, and Warminster to the southwest. The map also shows the locations of Richboro, Warminster Heights, and Warminster. The map is oriented with North at the top.

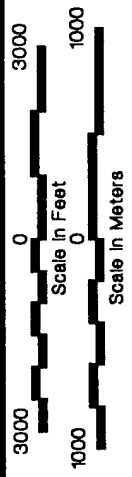
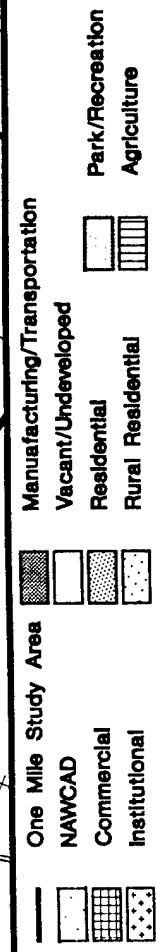


Figure 3.1-3

Elsewhere, the study area is dominated by residential, agricultural, vacant, and recreational uses. Most of the residential area is characterized by single-family detached homes, although some multi-family areas exist, primarily west of Route 132, Street Road. Most of the vacant, agricultural, and rural residential uses occur to the northeast of NAWCAD. A golf course, Spring Mill Country Club, is located immediately to the northeast of NAWCAD. Land use characteristics and development trends are summarized in the data presented in Tables 3.1-1 and 3.1-2.

3.1.2 Zoning and Land Use Policy

The Bucks County Planning Commission provides overall planning guidance in the county, while each locality is responsible for its own land use controls, including review of development plans, zoning and subdivision regulations, and the formulation of comprehensive plans. The breakdown of NAWCAD's approximately 824 acres (333 hectares) within each municipality is as follows:

- 609 acres (247 hectares) are within the Township of Warminster (74 percent);
- 46 acres (19 hectares) are within the Borough of Ivyland (5 percent); and
- 169 acres (68 hectares) are within the Township of Northampton (21 percent).

That portion of NAWCAD within Warminster is designated a Military Reservation (MR) zoning district, with the exception of the enlisted men's family housing area to the southeast of NAWCAD, which is designated a multi-family district (MF-1) (Figure 3.1-4, Zoning Districts). Northampton's portion of the base represents a clear zone at the end of Runway 09/27, presently in agricultural use, and is currently zoned Institutional/Public and Agricultural-Residential.

The Bucks County Planning Commission updated the *Comprehensive Plan for Bucks County* in December 1993. This guidance document expresses goals, policies, objectives, and strategies through the year 2020 on such issues as land use, natural resources, parks and recreation, housing, wastewater facilities, solid waste management, and community facilities.

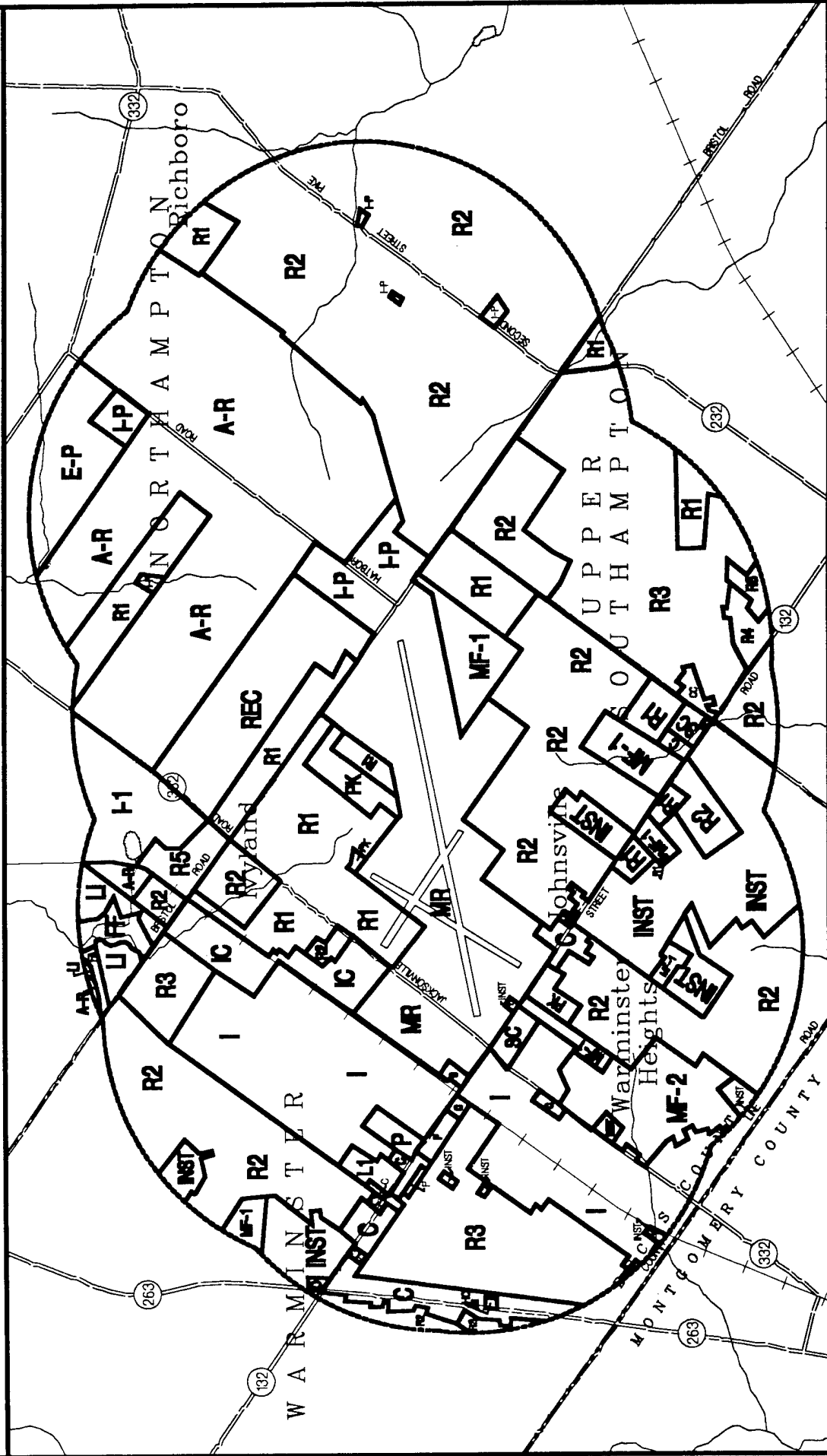
Zoning Districts Legend

MR	Military Reservation *	HC	Highway Commercial *
R1	Residential Conservation (Single Family) District	SC	Shopping Center *
R2	Low Density (Single Family) Residential	C	Commercial
R3	Moderate Density Residential	CC	Controlled Commercial +
R4	Moderately High Density Residential	P	Professional *
R5	High Density Residential	O	Office *
MF-1	Multi-Family Residential	IC	Industrial-Commercial ***
A-R	Agricultural-Residential	I	Industrial
		U	Light (Limited) Industrial
REC	Recreation **	I-1	Planned Industrial/Office **
PK	Park District *	FF	Flood-Fringe District ++
E-P	Environmental Protection District **	FA	General Flood Plain District ++
INST	Institutional *		
I-P	Institutional/Public **		

- * Unique to Warminster Township Zoning Map.
- ** Unique to Northampton Township Zoning Map
- *** Unique to Ivyland Borough Zoning Map.
- + Unique to Upper Southampton Township Zoning Map.
- ++ Unique to Warwick Township Zoning Map.

Sources:
Northampton Township Zoning Map, A.W. Martin Associates, Inc., 1977.
Zoning Map, Ivyland Borough, 1975.
Zoning Map, Upper Southampton Township Planning Commission, 1983.
Zoning Map, Warminster Township, 1989.
Zoning Map for Warwick Township, C. Robert Wynn Associates, 1995.

Zoning Districts



— Zoning District Boundary

— One Mile Study Area

3000 0 3000
Scale in Feet

1000 0 1000
Scale in Meters

Figure 3.1-4

Table 3.1-1
1990 Land Use Characteristics (in acres)

Municipality	Single-Family	Multi-Family	Rural Res.	Agricultural	Mining & Mfg.	Commercial	Trans. & Util.	Govt. & Instit.	Park & Rec.	Vacant	Total
Ivland	53	2	16	0	37	16	37	42	7	21	231
Northampton	5,662	149	1,461	3,089	181	245	1,481	636	1,978	1,649	16,531
Upper Southampton	2,149	134	292	0	123	220	565	212	251	285	4,231
Warminster	2,677	216	71	264	322	309	887	1,244	265	274	6,529
Warwick	1,025	42	1,063	2,637	103	29	369	257	603	1,003	7,131
Area Total	11,566	543	2,903	5,990	766	819	3,339	2,391	3,104	3,232	34,653

Source: Bucks County Planning Commission, Bucks County Continuum, 1994.

Table 3.1-2
1970-1990 Land Use Comparisons (percentages)

Municipality	Residential			Agricultural/Vacant			Non-Residential			Park & Recreation		
	1970	1980	1990	1970	1980	1990	1970	1980	1990	1970	1980	1990
Ivland	37	28	28	28	24	12	31	38	57	4	10	3
Northampton	24	33	40	58	45	33	8	12	15	10	9	12
Upper Southampton	61	59	58	21	18	10	16	20	26	1	3	6
Warminster	54	50	45	22	14	9	22	31	42	2	4	4
Warwick	20	19	22	73	69	59	3	5	11	3	7	8
Area Total	33	36	39	50	41	31	11	15	21	6	7	9

Source: Bucks County Planning Commission, Bucks County Continuum, 1994.

3.2 Socioeconomics

The study area for the review of existing socioeconomic conditions is dependent upon the geographic availability of demographic and economic data. Ivyland and Warwick are entirely within single census tracts; Warminster comprises seven tracts, Northampton six, and Upper Southampton four. While it is possible to obtain population, household, and housing data at the tract level, the tracts do not closely conform to the one-mi (1.6-km) radius used in the land use section. Thus, the broader municipal context is more appropriate when considering socioeconomic characteristics and their relationship to community services and employment pools. For these reasons, data are presented for the five municipalities, Bucks County, and where available, for Montgomery County and Philadelphia.

3.2.1 Demography

The population of the five municipalities surrounding NAWCAD exceeded 90,700 in 1990, an overall increase of 11 percent over the 1980 population level (Table 3.2-1). Among the five municipalities, Warminster and Ivyland experienced declines in population over the period, with Warminster losing more than 2,700 persons, or 7.6 percent. The largest increase in population was in Northampton with a gain of over 8,000, or 29 percent, over the decade. Projections of future population to the year 2000, made by the Bucks County Planning Commission, indicate that Warminster and Ivyland will remain essentially static, that Upper Southampton will experience modest growth, and that Northampton and Warwick will continue to experience rapid population growth.

Population data for the larger contexts of Bucks and Montgomery counties and the city of Philadelphia are shown in Table 3.2-1 for comparative purposes. Bucks County, with a growth rate of 13 percent, was one of the fastest-growing counties in the region during the 1980s and is expected to continue at a similar pace (12 percent) in the 1990s. Montgomery County's growth has been more modest at five percent, reflecting its more fully developed status, and is expected to continue to grow at about this rate in the 1990s. The city of Philadelphia experienced a significant population decline (six percent) in the 1980s, but is expected to reduce this rate of decline by half during the 1990s. For the region as a whole, population increased three percent in the 1980s and is expected to grow almost five percent in the 1990s.

Table 3.2-2 presents the population's age and ethnic characteristics from the 1990 Census. The two municipalities with the highest growth in the 1980s, Northampton and Warwick, also have the highest proportion of their population under age 18, reflecting the usual demographic profile of new suburbs. Ivyland and Upper Southampton have a smaller proportion under age 18 and a higher proportion over age 65, reflecting their more mature status. A similar pattern exists when comparing the age structure of Bucks, Montgomery, and Philadelphia, with Bucks having the highest proportion of persons under age 18 and least over age 65.

Table 3.2-1
Total Population

Municipalities	1980	1990	#Change 1980-90	%Change 1980-90	Estimate 1992	Projection 2000	% Change 1990-2000
Ivyland	581	498	-83	-14.30	507	490	-1.6
Northampton	27,392	35,406	8,014	29.30	37,157	45,500	28.5
Upper Southampton	15,806	16,076	270	1.70	15,967	17,000	5.7
Warminster	35,543	32,832	-2,711	-7.60	32,752	32,900	0.2
Warwick	2,307	5,915	3,608	156.40	6,618	9,070	53.3
Subtotal	81,629	90,727	9,098	11.10	93,001	104,960	15.7
Bucks Co.	479,211	541,174	61,963	12.90	556,279	606,500	12.1
Montgomery Co.	643,621	678,111	34,490	5.40	689,996	715,980	5.6
Philadelphia	1,688,210	1,585,577	-102,633	-6.10	1,552,572	1,562,865	-1.4
Sources: US Census, 1990, CP-1-40 and CPH-3; Bucks Co. Planning Commission, Municipal Demographic Profile, 1994, Bucks County Continuum, 1994; and Delaware Valley Regional Planning Commission, 1993 and 1994.							

Table 3.2-2
Age and Ethnic Characteristics 1990

Municipalities	Population				
	% Under 18	% Over 65	Median Age	% Black	% Hispanic
Ivyland	23.3	10.4	34.1	0	0.2
Northampton	35.0	9.3	33.9	0.4	0.7
Upper Southampton	26.8	19.1	37.8	0.8	0.7
Warminster	32.5	11.5	32.8	2.3	3.6
Warwick	43.1	6.2	31.3	0.5	1.2
Subtotal	30.0	10.6	N/A	1.1	1.6
Bucks Co.	33.0	13.2	33.7	2.8	1.6
Montgomery Co.	29.3	18.6	35.8	5.8	1.2
Philadelphia	23.9	15.2	33.1	39.9	5.6
Sources: US Census, 1990, CP-1-40 and CPH-3; Bucks Co. Planning Commission, Municipal Demographic Profile, 1994, and Bucks County Continuum, 1994; and Delaware Valley Regional Planning Commission, 1994.					

The minority populations of the five municipalities are very small, as less than one percent are Black (with the exception of Warminster, where 2.3 percent of the population is Black). These rates compare to a 40 percent Black population in Philadelphia. Similarly, Hispanics, who have varied heritages, are represented in very small numbers in the five municipalities. In this instance, Warminster had 3.6 percent and Warwick 1.2 percent with the other municipalities less than one percent. These rates compare to 5.6 percent Hispanic in Philadelphia.

3.2.2 Income

Household and family incomes in the five municipalities are among the highest in the region. As shown in Table 3.2-3, Northampton, Upper Southampton, and Warwick exceed the median for Bucks County. Warminster is slightly less and Ivyland notably less than the Bucks County median for family and household median incomes. Bucks County, as a whole, has median household incomes slightly lower than Montgomery County, but 76 percent higher than Philadelphia.

Poverty rates from the 1990 Census are presented in Table 3.2-3. With the exception of Warminster, the municipalities have a lower percentage of persons in poverty than Bucks County as a whole. About four percent of persons were in poverty in Bucks County in 1990, compared to 3.6 percent in Montgomery County and 20.3 percent in Philadelphia. The number of families in poverty shows lower percentages but a similar distribution among the municipalities and counties. Warminster recorded 3.3 percent of its families in poverty, compared to 2.9 percent for Bucks County, 2.2 percent for Montgomery County, and 16.1 percent for Philadelphia.

3.2.3 Housing

The great majority of housing in the study area is of a single-family detached character. Although there are some multi-family units, these tend to be low-rise townhouses or garden apartments. During the 1980s, Warwick and Northampton witnessed a dramatic increase in the number of housing units in their jurisdictions. The number of housing units in Warwick increased by almost 150 percent during the decade, and Northampton increased by almost 57 percent (Table 3.2-4). Warminster saw modest growth of five percent and Ivyland actually lost five percent of its housing units over the decade. Bucks County, as a whole, increased its housing by 20.9 percent, compared to 14.3 percent in Montgomery, and a decline of 0.6 percent in Philadelphia. Similar shifts are recorded for the number of households in the respective jurisdictions. Mean household size declined in all jurisdictions except fast-growing Warwick. The average for Bucks County declined from 3.01 persons in 1980 to 2.8 persons in 1990, a decline of seven percent.

Table 3.2-3
1990 Census 1989 Income Data

Municipalities	Median Household Income	Median Family Income	Per Capita Income	Persons In Poverty		Families In Poverty	
				Persons	%	Families	%
Ivyland	41,250	45,625	17,234	6	1.2	0	0
Northampton	59,285	63,019	22,373	544	1.5	99	1
Upper Southampton	47,825	55,015	20,205	530	3.3	116	2.6
Warminster	43,096	48,096	15,795	1,388	4.3	290	3.3
Warwick	56,721	57,997	20,588	64	1.1	13	0.8
Bucks Co.	43,347	48,851	18,292	21,076	4.0	4,232	2.9
Montgomery Co.	43,720	51,353	21,990	23,779	3.6	4,089	2.2
Philadelphia	24,603	30,140	12,091	313,374	20.3	61,253	16.1

Sources: US Census, 1990, CP-1-40 and CPH-3; Bucks Co. Planning Commission, Municipal Demographic Profile, 1994, and Bucks County Continuum, 1994; and Delaware Valley Regional Planning Commission, 1993 and 1994.

Table 3.2-4
Housing and Households

Municipalities	Housing Units			Total Households			Mean Household Size		
	1980	1990	% Change	1980	1990	% Change	1980	1990	% Change
Ivyland	203	192	-5.4	195	186	-4.6	2.98	2.63	-11.7
Northampton	7,333	11,486	56.6	7,171	11,105	54.9	3.77	3.17	-15.9
Upper Southampton	5,062	5,918	16.9	4,963	5,778	16.4	3.17	2.75	-13.2
Warminster	10,655	11,207	5.2	10,209	10,846	6.2	3.43	2.96	-13.7
Warwick	797	1,981	148.6	756	1,914	153.2	3.04	3.09	1.6
Bucks Co.	165,438	199,934	20.9	156,648	190,507	21.6	3.01	2.8	-7.0
Montgomery Co.	232,569	265,856	14.3	223,290	254,995	14.20	2.79	2.58	-7.5
Philadelphia	678,973	674,899	-0.6	619,781	603,075	-2.70	2.66	2.56	-3.8

Sources: US Census, 1990, CP-1-40 and CPH-3; Bucks Co. Planning Commission, Municipal Demographic Profile, 1994, and Bucks County Continuum, 1994; and Delaware Valley Regional Planning Commission, 1993 and 1994.

In 1990, the proportion of housing occupied by owners was highest in Northampton and Warwick and lowest in Warminster (Table 3.2-5). Conversely, the proportion of renters is highest at 26.8 percent in Warminster and lowest at 8.7 percent in Northampton. The percent of renters in Bucks County is 24.3 percent, Montgomery County 27.7 percent, and Philadelphia 38.1 percent. The vacancy rate for housing for-sale is very low among the five municipalities; only Northampton, at 1.8, percent exceeded the Bucks County rate of 1.6 percent. Similarly, only Northampton's rate of ten percent vacant-for-rent exceeded the Bucks County rate of 8.3 percent. By comparison, Montgomery's vacant-for-rent rate was 6.3 percent and Philadelphia's was 9.7 percent.

Median housing values in 1990 ranged from \$131,300 in Ivyland to \$195,500 in Northampton. The mean for Bucks County was \$148,350, compared to \$143,400 in Montgomery County and \$49,400 in Philadelphia. Median monthly gross rent levels in the study area ranged from \$511 in Warminster to \$814 in Warminster, compared to \$602 for Bucks County and \$452 in Philadelphia. Clearly, the study area is best characterized as relatively expensive suburbia, in part characterized by recent rapid growth of single-family detached homes.

3.2.4 Employment

The 1990 census data on the labor force resident in the study area are shown in Table 3.2-6. As can be seen, the five municipalities had a combined labor force of 50,850 with 49,219 employed, providing an unemployment rate of 3.2 percent, lower than the Bucks County rate of 3.9 percent. Among the individual municipalities, unemployment rates ranged from 2.5 percent in Ivyland to 3.7 percent in Upper Southampton. Participation in the labor force was highest in Warwick Township, at 77.5 percent, and lowest in Upper Southampton, at 67.8 percent, which compares to 71.1 percent for Bucks County. Distribution of the employed residents in Bucks, Montgomery, and Philadelphia, by industrial category in 1991, is also shown in Table 3.2-7.

As presented in Table 3.2-7, the major category of employment in all three jurisdictions is in Services, ranging from 27.4 percent in Bucks County to 38.8 percent in Philadelphia. Retail Trade is the second highest category in Bucks County at 21.8 percent, compared to 14.2 percent in Philadelphia. Manufacturing is the next leading category in Bucks County, at 21.4 percent, compared to 12.1 percent in Philadelphia. Although Government is considered separately in the data source, which includes only "covered" employment, Government is a much higher percentage of employment in Philadelphia at 19 percent, compared to 11 percent in Bucks County.

Annual employment and income data is available from the US Bureau of Economic Analysis (BEA), Regional Economic Information System. Bucks County data for 1990-1992 is provided in Table 3.2-8. These data rely on mid-year Census population estimates for 1991 and 1992. Total personal income is seen to rise substantially during 1991 and 1992, with annual growth rates of six percent and nine percent, respectively. Although Bucks County is substantially above the national average in per

Table 3.2-5
Housing Characteristics

Municipalities	Tenure 1990		Vacancy Rate 1990		1990 Median Housing	
	% Owner	% Renter	% Owner	% Renter	Value \$	Rent \$
Ivyland	81.7	18.3	0	5.6	131,300	538
Northampton	91.3	8.7	1.8	10	195,500	814
Upper Southampton	83.0	17.0	0.8	6.1	158,100	634
Warminster	73.2	26.8	0.7	8.1	143,700	511
Warwick	89.0	11.0	0.9	3.2	180,700	718
Bucks Co.	75.7	24.3	1.6	8.3	148,350	602
Montgomery Co.	72.3	27.7	1.4	6.3	143,400	593
Philadelphia	61.9	38.1	2.2	9.7	49,400	452
Sources: US Census, 1990, CP-1-40 and CPH-3; Bucks Co. Planning Commission, Municipal Demographic Profile, 1994, and Bucks County Continuum, 1994; and Delaware Valley Regional Planning Commission.						

Table 3.2-6
Resident Labor Force and Employment 1990

Jurisdiction	Labor Force	% in Labor Force	Employment	% Unemployed
Ivyland	283	72.8	276	2.5
Northampton	19,388	72.7	18,853	2.8
Upper Southampton	8,860	67.8	8,532	3.7
Warminster	19,070	75.0	18,423	3.4
Warwick	3,249	77.5	3,135	3.5
Subtotal	50,850	96.8	49,219	3.2
Bucks County	296,484	71.1	284,984	3.9
Source: Bucks County Planning Commission, Municipal Demographic Profile, 1994; and Bucks County Continuum, 1994.				

Table 3.2-7
Employment Characteristics by Industry

Employment Category	Bucks	Montgomery	Philadelphia		Employment Category	Bucks	Montgomery	Philadelphia
Total Employment	200,150	394,338	637,642		Wholesale Trade	12,952	26,101	33,213
Ag. Forest. Fish.	2,373	4,586	n/a		Percent of Co. Total	6.5	6.6	5.2
Percent of Co. Total	1.2	1.2	n/a		No. of Establishments	1,523	2,457	2,103
No. of Establishments	379	503	n/a		Average Annual Wage	\$32,302	\$36,698	\$33,942
Average Annual Wage	\$17,848	\$22,117	n/a		Retail Trade	43,568	66,769	90,651
Mining	435	183	n/a		Percent of Co. Total	21.8	16.9	14.2
Percent of Co. Total	0.2	0	n/a		No. of Establishments	2,791	4,121	7,196
No. of Establishments	14	9	n/a		Average Annual Wage	\$14,685	\$14,267	\$14,785
Average Annual Wage	\$45,304	\$38,099	n/a		F.I.R.E.	9,006	34,501	63,489
Construction	10,251	19,934	12,978		Percent of Co. Total	4.5	8.7	10
Percent of Co. Total	5.1	5.1	2		No. of Establishments	875	1,877	2,097
No. of Establishments	1,877	2,285	1,469		Average Annual Wage	\$27,827	\$30,448	\$36,700
Average Annual Wage	\$30,352	\$33,719	\$34,055		Services	54,908	117,138	247,621
Manufacturing	42,823	85,902	76,849		Percent of Co. Total	27.4	29.7	38.8
Percent of Co. Total	21.4	21.8	12.1		No. of Establishments	4,740	8,522	10,967
No. of Establishments	1,194	1,475	1,683		Average Annual Wage	\$21,476	\$25,689	\$27,959
Average Annual Wage	\$31,448	\$37,305	\$33,255		Government	22,305	28,983	134,763
Transport & Utilities	5,448	14,683	32,946					
Percent of Co. Total	2.7	3.7	5.2					
No. of Establishments	463	539	732					
Average Annual Wage	\$29,325	\$32,887	\$36,550					

Source: Bucks County Planning Commission, Socioeconomic Profile of Bucks County and Region, 1994.

Table 3.2-8
Bucks County Income and Employment 1990-92

Economic Category	1990	1991	1992
Population	543,100	550,000	556,300
Total Personal Income (\$1,000s)	12,209,793	12,489,462	13,183,145
Annual Growth Rate (%)	2	6	9.37
Per Capita Personal Income (\$)	22,483	22,709	23,699
% of National Average	120	119	118
Wage & Salary Disbursements (\$1,000s)	5,363,109	5,369,746	5,625,255
Full & Pt.-Time Wage/Salary Employment	226,769	220,655	219,329
Average Wage per Job (\$)	23,650	24,335	25,648
Total Gross Earnings Inflow (\$1,000s)	4,654,737	4,711,519	4,978,699
Total Gross Earnings Outflow (\$1,000s)	1,911,443	1,916,559	2,001,811
Net Residence Adjustment (\$1,000s)	2,743,294	2,794,960	2,976,888
Source: US Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, 1994			

capita income, it falls from 120 percent to 118 percent over the period. It can be seen that full and part-time employment declines from over 226,000 to 219,000 over the period, although higher wages per job manage to increase total disbursements despite the decline in employment. The net earnings to residents in the county increased from \$2.7 billion to almost \$3 billion over the period.

3.3 Community Facilities and Services

3.3.1 Education

Both public and private schools are located within the one-mi (1.6-km) radius of NAWCAD. Three public school districts are partially located within the study area (Figure 3.3-1, Community Facilities): Centennial, which includes Warminster, Ivyland, and Upper Southampton; Council Rock, which includes Northampton; and Central Bucks, which includes Warwick. However, the portions of the study area in Warwick and Northampton Townships have no schools and, for this reason, are omitted from further analysis. The Centennial School District has four schools in the area, three elementary schools, and one high school. District enrollment at the elementary school level has declined slightly over the period 1990-93, from 3,204 to 3047, a drop of five percent. At the secondary level, enrollment has been essentially constant over the same period. Figure 3.3-1 shows the study area with the school district lines and the location of the various public and private schools. Public and private school enrollment as of 1994-95 is shown in Table 3.3-1.

Institutions of higher education in Bucks County include Bucks County Community College, Delaware Valley College of Science and Agriculture, and the Delaware Valley College of Textiles and Science. The larger Philadelphia region has 58 colleges and universities.

3.3.2 Health Care

While many of the larger and more specialized hospitals in the region are located in the city of Philadelphia, Lower Bucks County contains several well-regarded local hospitals (Table 3.3-2): the Lower Bucks Hospital; Allegheny University Hospital (formerly Warminster General Hospital); Delaware Valley Medical Center; and Saint Mary's Hospital (formerly Centennial Springs Health Care Center) (Figure 3.3-1). These facilities also provide long-term care (nursing homes) for the study area: Majestic Oaks, with 180 approved beds, is close to Warminster General Hospital. Southampton Estates Medical Facility, with 100 beds, is on Street Road at the southern extreme of the study area (Figure 3.3-1).

3.3.3 Public Safety and Emergency Services

Police

Police services in the study area are provided by the respective township and borough police forces. Those for Ivyland, Southampton, and Warminster have their police station within or close to the one-mi (1.6-km) study area. The Northampton police station is in Richboro, approximately 2.5 mi (4 km)

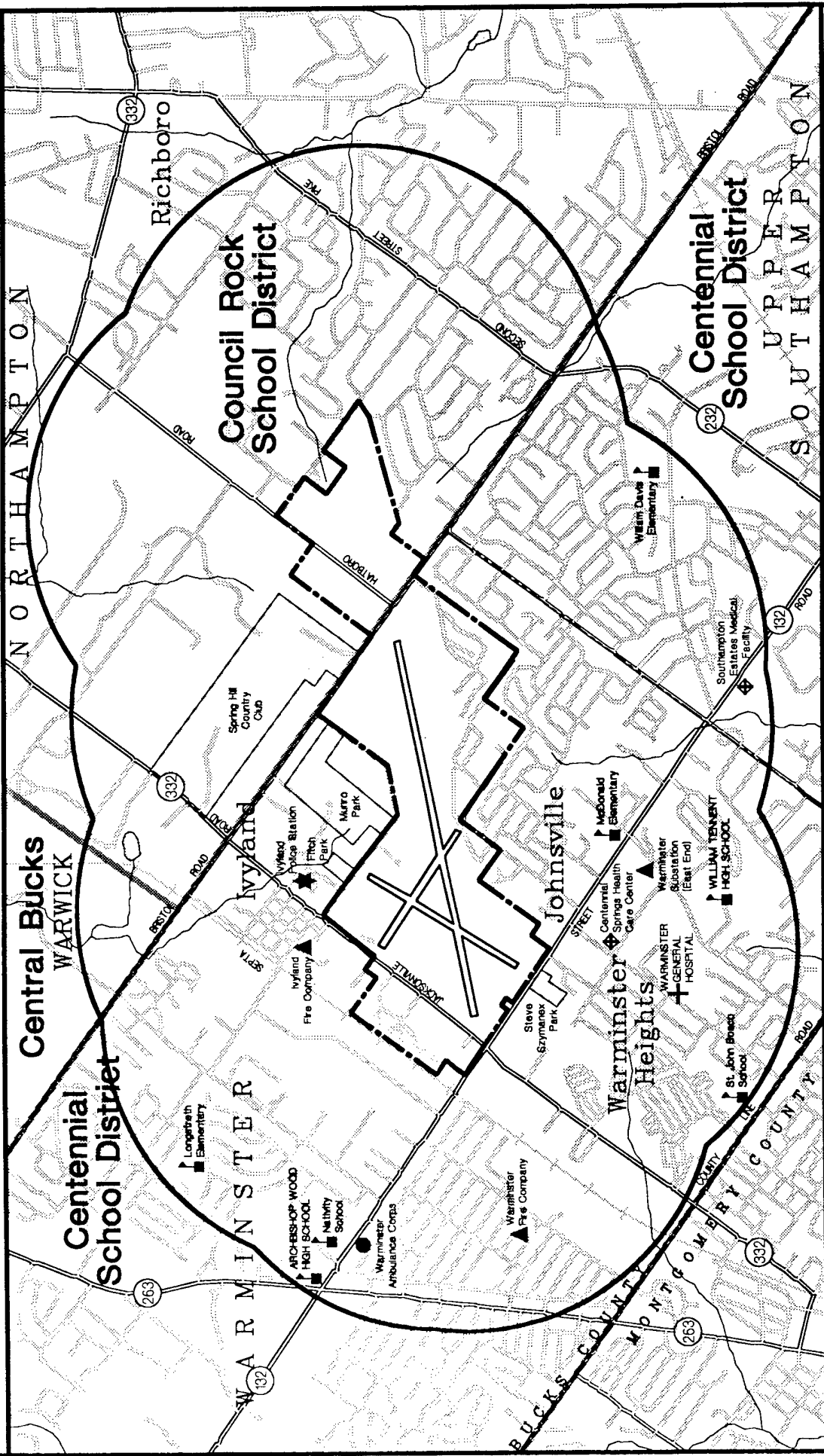
Table 3.3-1
Educational Facilities and Enrollment, 1994-95

Schools	Grades	Enrollment
Public Schools		
William H. Davis	Elementary	365
Longstreth	Elementary	472
Everett A. McDonald	Elementary	750
William Tennant	High School	1,772
Private Schools		
St. John Bosco	K-8	288
Nativity School	K-8	698
Archbishop Wood	High School	1,123
Source: Centennial School District and individual schools.		

Table 3.3.2
Hospitals in Lower Bucks County 1988

Hospital	Licensed Beds	Occupancy Rate
Delaware Valley Medical Center	210	68.7
Lower Bucks Hospital	320	69.6
Saint Mary's Hospital	251	79.3
Allegheny University Hospital	200	66.8
Source: Pennsylvania Department of Health, cited in Bucks County Planning Commission, <u>Community Facilities: Health Care</u> , Oct. 1991.		

Community Facilities



One Mile Study Area

NAWCAD

Fire Company

School District Boundary

School

Hospital

Nursing Home

Ambulance

Police Station

Park or Recreation

Scale in Feet

0 1000 3000

Scale in Meters

0 1000 3000

Figure 3.3-1

east of NAWCAD, and the Warwick police station is approximately 4.5 mi (7.2 km) north of NAWCAD.

Fire

The Bucks County Planning Commission reported five volunteer fire companies and/or substations in close proximity to NAWCAD (*Community Facilities: Emergency Services*, 1990). Four of these are in Warminster and one in Ivyland (Figure 3.3-1):

- Ivyland Fire Company;
- Hartsville Fire Company;
- Warminster Fire Company;
- Warminster Substation (East End); and
- Warminster Substation (West End).

The Bucks County fire marshal's office generally considers the equipment to be in good condition and adequate supply (Bucks County Planning Commission, 1990).

Prior to 1995, NAWCAD had been providing fire protection and other emergency services in accordance with mutual aid agreements with local fire services where Navy fire crews were typically first-on-the-scene respondents during the daytime.

Ambulance

Ambulance service companies in Bucks County are independently operated, serving defined regions. They may be privately-owned, hospital-based, or aligned with a fire company or other civic organization, but are not municipal services. Ambulance companies are accountable to the Pennsylvania Department of Health, Division of Medical Services. Bucks County maintains a Department of Health Services and a Health Services Council, which provides advice to the regional council.

Warminster and most of Warwick are served by the Warminster Ambulance Corps (Squad 122), an advanced life support (ALS) unit located approximately one mi (1.6 km) northwest of NAWCAD on Street Road. The area in Northampton proximate to NAWCAD is served by Trihampton, Northampton Substation (Squad 115), an ALS unit located in Richboro, approximately two mi (three km) east of NAWCAD. Upper Southampton is served by Trihampton, Southampton Substation (Squad 113), an ALS unit located on Street Road approximately three mi (five km) southeast of NAWCAD. The one-mi (1.6-km) study area around NAWCAD is well within the four-mi (six-km)

radius from the three referenced ALS squads (approximately eight-minute response time that serves as a county standard).

Parks and Recreation

There are no state or county parks in proximity to NAWCAD. The nearest facilities are Tyler State Park, straddling the Northampton and Newtown line, about three mi (five km) east of NAWCAD, and Dark Hollow County Park on the Neshaminy Creek, straddling the Warwick and Buckingham line, about five mi (eight km) north of NAWCAD. Three municipal parks with playgrounds, operated by the Town of Warminster, are directly adjacent to NAWCAD (Figure 3.3-1):

- Steve Szymanek Park, approximately 10.6 acres (4.3 hectares), directly across Street Road at the southwestern edge of NAWCAD;
- Fitch Park, approximately 5.5 acres (2.2 hectares), directly north of NAWCAD; and
- Munro Park, approximately 34 acres (13.8 hectares), directly north of NAWCAD.

A nearby private recreational facility is the Spring Hill Country Club, a golf course of approximately 185 acres (75 hectares) located to the northeast of NAWCAD across Bristol Road in Northampton.

3.4 Transportation

3.4.1 Traffic

Local Street Network

Regional access to NAWCAD is provided by I-276 (the Pennsylvania Turnpike), which runs east-west. Access from Philadelphia is provided by Second Street Pike and Street Road (via Route 1). Local roadway circulation is provided by several arterials that abut office buildings, commercial establishments, residential developments, and NAWCAD itself.

Key study area roadways include:

- Street Road - This is the main roadway in the study area, with a peak hour directional volume of approximately 1,500 vehicles. It is a four-lane arterial roadway with substantial commercial development along its length. Street Road provides access to I-276 at Interchange 28 of the Turnpike. The roadway, joining with Route 1, connects the study area with Philadelphia.
- Jacksonville Road - This roadway is a two-lane connector that provides access to several parking areas for NAWCAD. Peak hour directional volumes adjacent to the site reach 780 vehicles per hour. Jacksonville Road runs through the NAWCAD, separating the research and operations facilities.
- York Road - This four-lane arterial roadway provides access to the study area from the north. Directional hourly volumes reach 1,300 vehicles during peak hours. Dual left turn lanes are provided at Street Road to accommodate base-generated traffic.
- County Line Road - This four-lane arterial roadway forms the boundary between Bucks County and Montgomery County. Peak hour directional volumes reach 1,425 vehicles in the study area.
- Second Street Pike - A four-lane arterial roadway, Second Street Pike provides a link between the study area and northern Philadelphia. Peak hour directional volumes on this roadway reach 800 vehicles per hour.

Traffic Characteristics

Traffic data were collected at eight locations for this analysis (Figure 3.4-1, Traffic Count Locations). The traffic counts were conducted on April 26th and 27th, 1995 for the am (6:30 to 9:30) and pm (3:30 to 6:30) peak periods. Both turning movement counts and vehicle classifications were obtained.

Turning movement counts establish the existing volumes of traffic moving on the street network. Vehicle classifications identify the types of vehicles (e.g., autos, light trucks, and heavy trucks) using each link in the analysis network. Each of the intersections counted was also inventoried to identify those parameters used to determine the capacity of the intersection and its approaches, as specified by the Transportation Research Board's *Highway Capacity Manual* (HCM), 1994. The HCM is the industry standard for traffic analysis.

Specifically, each traffic signal was inventoried for its cycle length, phasing (green time allocated for each movement), and progression characteristics (to determine the traffic arrival type). Geometric conditions of the intersection, such as street widths, lane widths, and crosswalk widths, were recorded. General operating conditions, such as posted parking regulations, number of parking maneuvers by vehicles during peak periods, impacts on traffic made by local buses making stops, and pedestrian interference with traffic movements, were also observed.

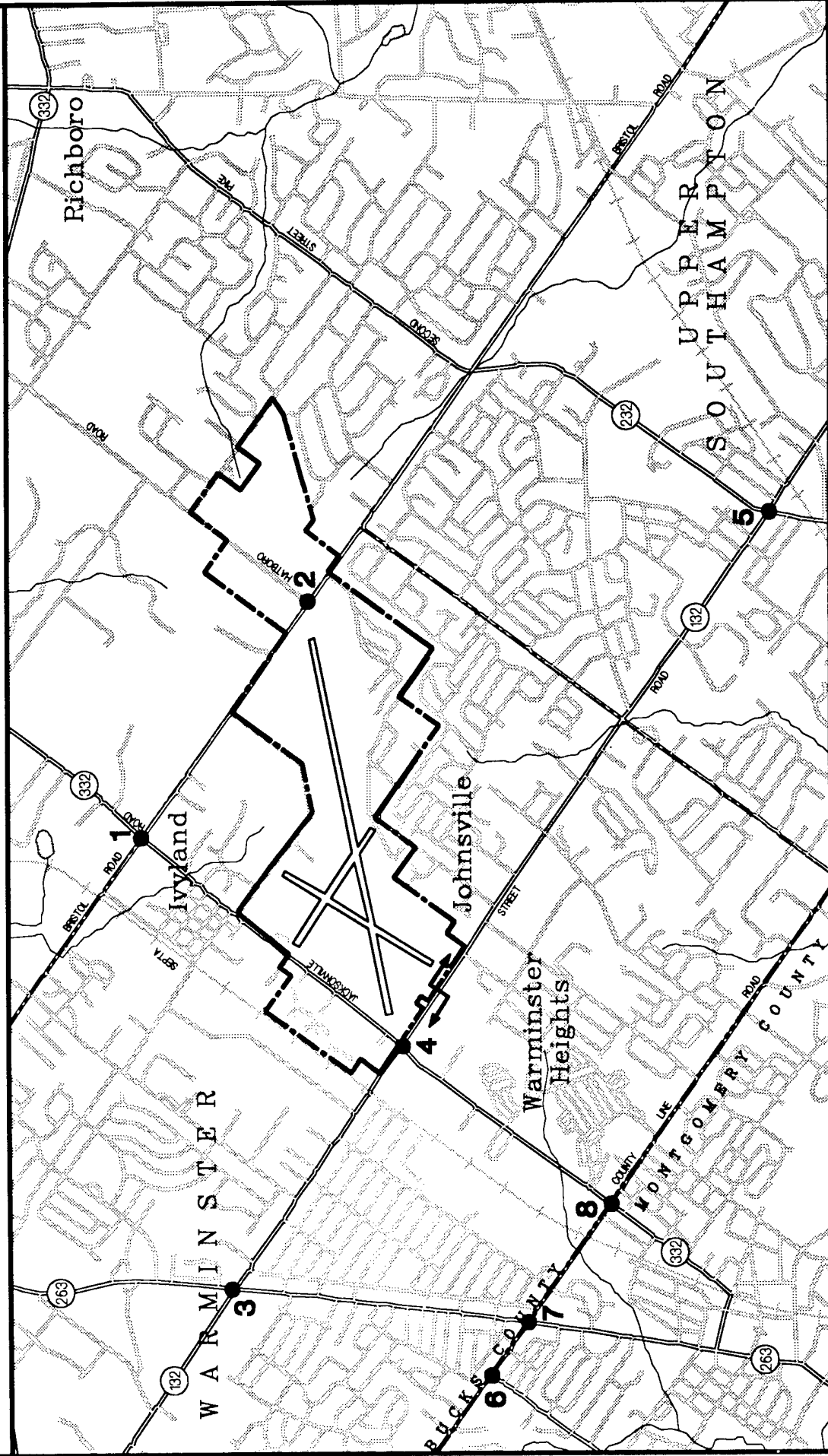
A review of the count data indicates typical am and pm commuter peak periods. The peak hours generally occur between 7:15 to 8:15 am and 4:30 to 5:30 pm. Overall volumes within the study area are moderate to heavy. Although overall progression on the arterial roadways is acceptable, localized delays are experienced at most signalized intersections. Capacity analyses were performed for each intersection inventoried.

Capacity Analysis

The 1994 HCM provides a methodology to determine the capacity and level of service of signalized and unsignalized intersections for each approach, as well as the intersection as a whole. The capacity of an intersection is defined as the maximum rate of flow that may pass through the intersection under prevailing traffic and roadway conditions. The quality of traffic flow through an intersection is described by the intersection's level of service (LOS). Level of service for signalized intersections is defined by the "average stopped delay" time per vehicle for various movements within the intersection (see Table 3.4-1 for the level of service criteria expressed in terms of average stopped delay). Level of service for a stop-controlled intersection is also based on an average delay per vehicle, which is computed from available gaps in the major roadway traffic stream (see Table 3.4-2).

Capacity analyses were performed at all eight count locations. Figures 3.4-2 (Intersection Diagrams: Locations 1-4) and 3.4-3 (Intersection Diagrams: Locations 5-8) provide a physical inventory of each intersection considered. Generally, the intersections operate at or near capacity (LOS E) with lengthy queues and delays experienced by vehicles. The results of the capacity analyses for existing conditions at the signalized intersections are provided in Table 3.4-3. The table provides intersection approach volumes, volume/capacity ratios, stopped delay, and lane group level of service. Table 3.4-4 provides the results of the analysis at the stop-controlled intersection of Hatboro and Bristol Roads (Location 2). Following is a brief description of each intersection and its existing operational characteristics.

Traffic Count Locations



● Traffic Count Location
 ~ 7 Day Automatic Traffic Recorder
 --- NAWCAD Property Boundary

3000 0 3000
 Scale in Feet
 1000 0 1000
 Scale in Meters

Figure 3.4-1

Intersection Diagrams: Locations 1-4

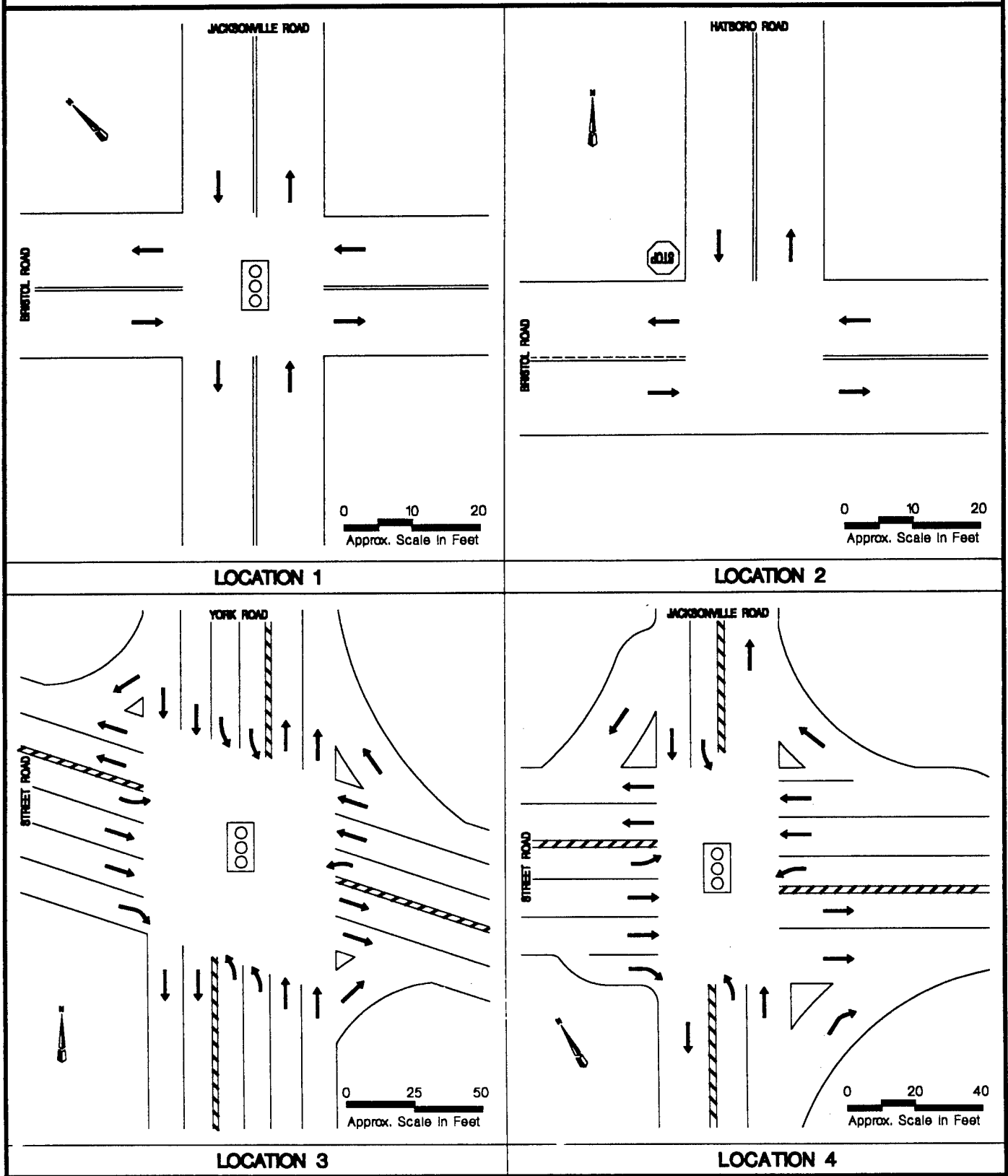
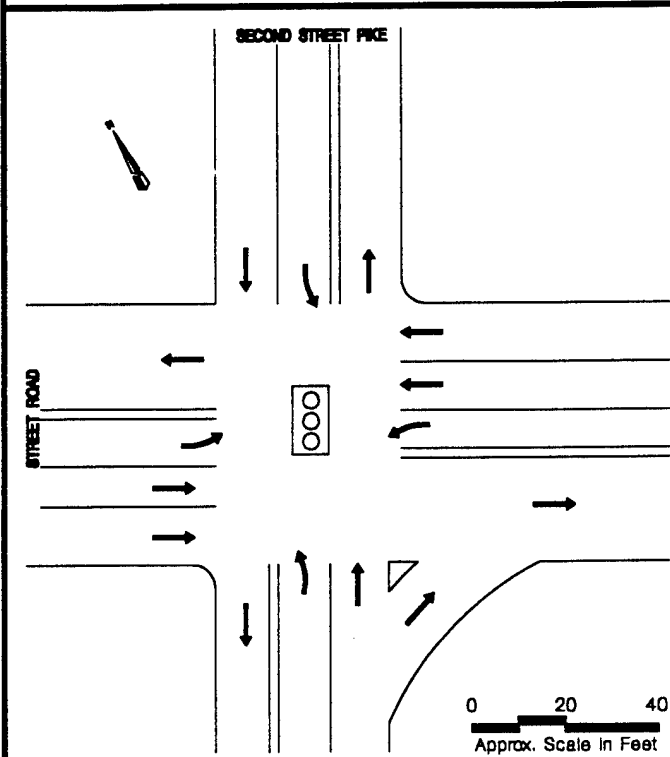
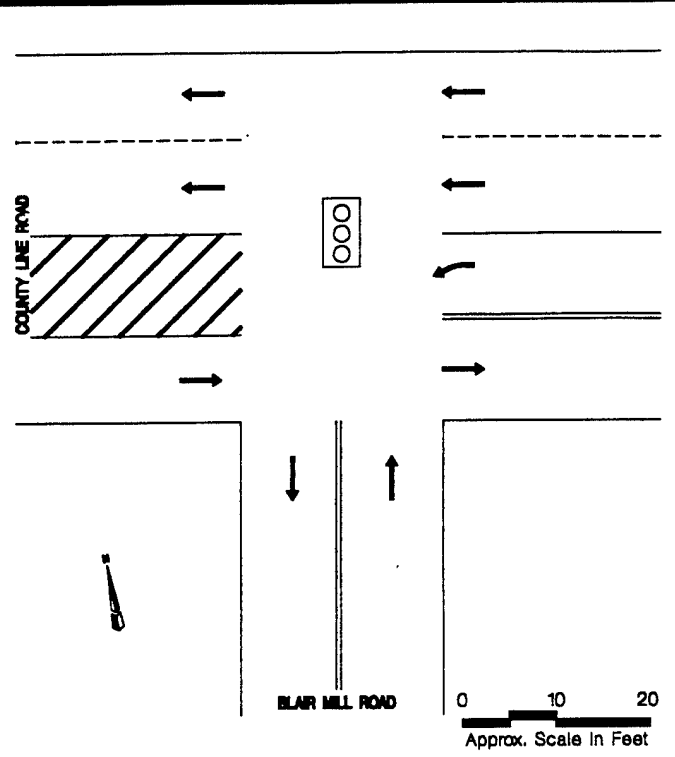


Figure 3.4-2

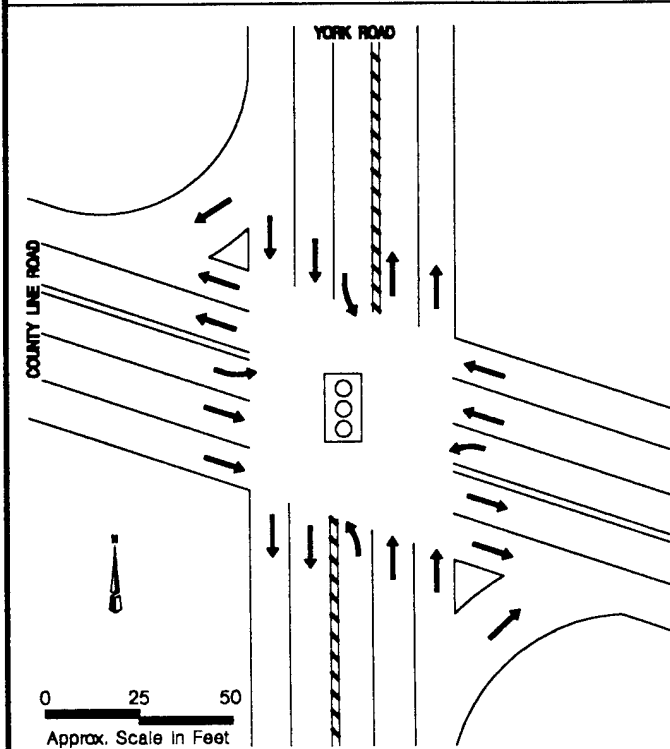
Intersection Diagrams: Locations 5-8



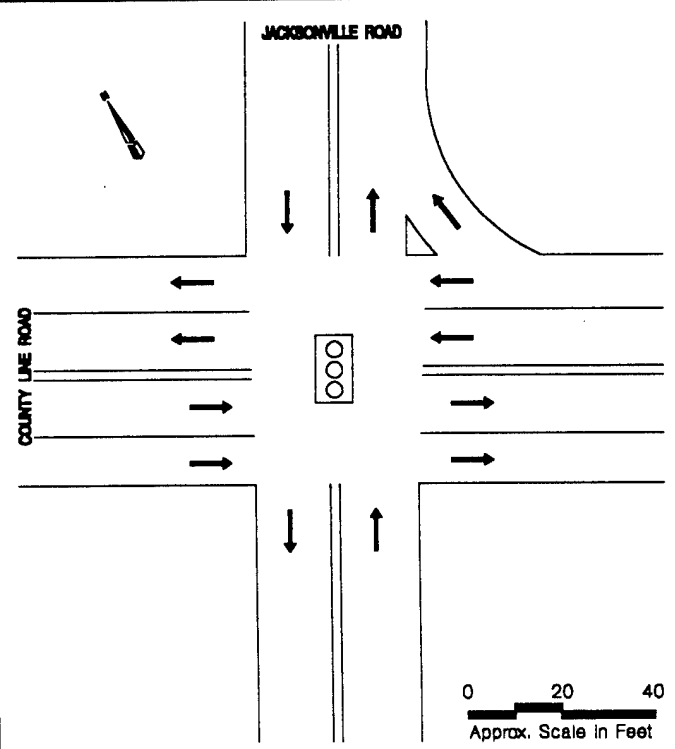
LOCATION 5



LOCATION 6



LOCATION 7



LOCATION 8

Figure 3.4-3

- Bristol Road and Jacksonville Road (Location 1) - This location is controlled by a three-phase traffic signal. The eastbound approach is afforded a leading green indication. Although the existing volumes are moderate (hourly approach volumes range from 441 to 660 vehicles per hour [vph]), the approaches operate at poor LOS, as only one lane is provided for each approach.
- Hatboro Road and Bristol Road (Location 2) - The location is a T-intersection with stop-control on Hatboro Road. Flow along Bristol Road is uninterrupted and operations are acceptable. Traffic turning onto Bristol Road from Hatboro experiences delays, as vehicles must await suitable gaps. The delay is greatest for left-turning vehicles, which must clear suitable gaps in both eastbound and westbound Bristol Road traffic. Level of service for the left turn movement is F during the am and pm peaks.
- Street Road and York Road (Location 3) - The intersection of these four-lane arterials roadways is controlled by a four-phase traffic signal. Protected green arrows are provided for left turns on each approach. Heavy approach volumes (up to 1300 vph) result in operation at or near capacity during peak periods, with several individual lane groups at LOS F.
- Street Road and Jacksonville Road (Location 4) - This intersection is controlled by a four-phase traffic signal with a protected left turn phase for each approach. This intersection is immediately adjacent to the NAWCAD, and most base-generated traffic passes through this intersection. Volumes are high, with hourly volumes reaching 1480 vph. Operation during both peaks is poor, with overall LOS E and F for the am and pm peaks respectively. Most lane groups operate at LOS E or worse.
- Street Road and Second Street Pike (Location 5) - This intersection is controlled by a four-phase traffic signal with a protected left turn phase for each approach. Traffic volumes are high (approach volumes reach 1100 vph), and the intersection reaches constrained operation during both peaks. Overall operations are LOS C/D and LOS D during the am and pm peaks respectively.
- County Line Road and Blair Mill Road (location 6) - This T-intersection is controlled by a three-phase signal with a protected phase provided for the eastbound approach. Operation during the am peak is acceptable (overall LOS C). Constrained operation is experienced during the pm peak, with LOS F for the northbound approach and overall LOS D.
- County Line Road and York Road (Location 7) - This location is controlled by a four-phase signal with a protected left turn phase for each approach. Volumes on all approaches are moderate to high, with hourly volumes up to 1425 vph. Overall, the intersection operates at LOS E and F during the am and pm peaks, respectively.

Table 3.4-1

Traffic Level of Service Definitions for Signalized Intersections

LOS	Description
A	Level A describes operations with very low delay, i.e., less than 5.0 seconds per vehicle. This occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Level B describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
C	Level C describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level, although many still pass through the intersection without stopping.
D	Level D describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At Level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high vehicle/cycle ratios. Many vehicles stop and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Level E describes operations with delay in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.
F	Level F describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00, with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.
Source: Transportation Research Board Special Report, 209, Highway Capacity Manual, 1994.	

Table 3.4-2

Level of Service Criteria for Stop-Controlled Intersections

Level of Service	Average Total Delay (SEC/VEH)
A	≤ 5
B	$> 5 \text{ and } \leq 10$
C	$> 10 \text{ and } \leq 20$
D	$> 20 \text{ and } \leq 30$
E	$> 30 \text{ and } \leq 45$
F	> 45

Table 3.4-3

Summary of LOS Analysis - Existing Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	LOS	Appr. Volume	V/C Ratio	Stopped Delay	LOS
Bristol Road and Jacksonville Road (Location 1)								
EB	660	0.953	27.3	D	6	0.000	20.0	C
WB	553	2.102	*	F	599	1.656	*	F
NB	441	1.286	*	F	481	1.403	*	F
SB	493	1.135	97.1	F	520	1.210	*	F
Overall:			*	F			*	F
Street Road and York Road (Location 3)								
EB L	226	0.946	67.5	F	642	2.687	*	F
EB T	742	0.817	33.2	D	763	0.818	32.7	D
EB R	39	0.096	23.0	C	118	0.283	24.0	C
WB L	185	0.776	46.0	E	214	0.897	58.7	E
WB T	486	0.536	27.0	D	785	0.842	33.8	D
WB R	291	0.569	28.2	D	287	0.545	27.3	D
NB L	226	0.772	47.3	E	263	0.673	40.4	E
NB T	892	0.863	32.8	D	773	0.852	34.8	D
NB R	190	0.324	22.4	C	30	0.069	22.8	C
SB L	152	0.519	40.1	E	291	0.745	42.6	E
SB TR	676	0.667	26.6	D	612	0.673	29.2	D
Overall:			34.0	D			*	F
Street Road and Jacksonville Road (Location 4)								
EB L	162	0.646	38.0	D	112	0.489	35.7	D
EB T	839	0.931	40.8	E	971	1.077	76.9	F
EB R	323	0.674	30.6	D	150	0.307	24.2	C
WB L	268	1.081	107.0	F	264	1.170	*	F
WB T	926	1.027	59.7	E	765	0.848	34.2	D
WB R	288	0.565	27.8	D	298	0.592	28.4	D
NB L	191	1.046	103.3	F	275	1.342	*	F
NB T	321	0.788	36.8	D	372	0.912	48.1	E
NB R	47	0.129	24.9	C	143	0.414	27.5	D
SB L	140	0.799	52.1	E	287	1.453	*	F

Table 3.4-3

Summary of LOS Analysis - Existing Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	LOS	Appr. Volume	V/C Ratio	Stopped Delay	LOS
SB T	405	0.986	62.0	F	281	0.684	32.4	D
SB R	221	0.501	28.7	D	150	0.406	27.4	D
Overall:			53.0	E			*	F
Street Road and Second Street Pike (Location 5)								
EB L	66	0.408	15.2	C	121	0.636	20.5	C
EB TR	836	0.793	24.8	C	955	0.928	33.2	D
WB L	81	0.483	16.5	C	91	0.467	16.7	C
WB TR	827	0.753	23.7	C	1003	0.952	36.2	D
NB L	121	0.674	19.9	C	202	0.827	30.5	D
NB TR	389	0.704	22.7	C	492	0.994	50.9	E
SB L	185	0.859	34.0	D	160	0.647	19.6	C
SB TR	492	0.761	24.4	C	491	0.831	29.4	D
Overall:			24.0	C			34.8	D
County Line Road and Blair Mill Road (Location 6)								
EB TR	838	0.822	24.1	C	1011	0.995	41.8	E
WB L	425	0.863	27.1	D	365	0.930	39.1	D
WB T	707	0.359	5.4	B	905	0.512	8.5	B
NB	350	0.865	35.8	D	588	1.056	70.7	F
Overall:			20.4	C			35.4	D
County Line Road and York Road (Location 7)								
EB L	62	0.000	22.0	C	1	0.000	23.0	C
EB TR	834	0.948	37.9	D	908	0.973	39.6	D
WB L	278	0.967	58.0	E	398	1.328	*	F
WB TR	863	1.041	58.8	E	1028	1.119	89.2	F
NB L	165	0.809	39.8	D	120	0.596	31.0	D
NB T	470	0.683	24.9	C	450	0.626	25.1	D
NB R	322	0.909	44.7	E	255	0.608	26.1	D
SB L	51	0.254	25.5	D	92	0.463	28.5	D
SB T	386	0.586	23.6	C	696	1.013	54.5	E
SB R	65	0.210	20.6	C	66	0.177	21.6	C
Overall:			40.6	E			*	F

Table 3.4-3

Summary of LOS Analysis - Existing Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
County Line Road and Jacksonville Road (Location 8)								
EB	988	1.054	52.4	E	926	1.080	63.6	F
WB LT	789	0.601	11.0	B	953	0.702	13.7	B
WB R	326	0.295	8.5	B	196	0.200	9.1	B
NB	365	0.762	26.3	D	380	0.884	33.2	D
SB	647	0.742	19.9	C	934	0.933	28.8	D
Overall:			27.8	D			34.1	D
Notes: NB-Northbound; SB-Southbound; EB-Eastbound; WB-Westbound L-Left turn; R-Right turn; T-Through								

Table 3.4-4

Summary of LOS Analysis - Existing Condition
(Unsignalized)

Lane Group	AM Peak Hour			PM Peak Hour		
	Appr. Volume	Avg. Total Delay	L O S	Appr. Volume	Avg. Total Delay	L O S
Hatboro Road and Bristol Road (Location 2)						
Hatboro Road Left	115	64.2	F	112	231.3	F
Hatboro Road Right	151	6.6	B	68	5.4	B
Bristol Road Left	91	4.7	A	192	5.5	B
Overall		21.1	D		40.2	E

- County Line and Jacksonville Road (Location 8) - This location is controlled by a three-phase signal with a leading protected phase for the southbound roadway. Approach volumes of up to 1150 vph enter the intersection during peak hours. The intersection experiences constrained operation (LOS D) during both am and pm peaks. The eastbound approach operates poorly during both am and pm peaks (LOS E and F, respectively).
-

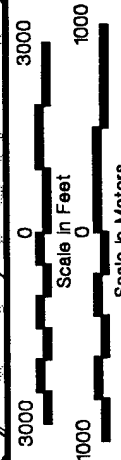
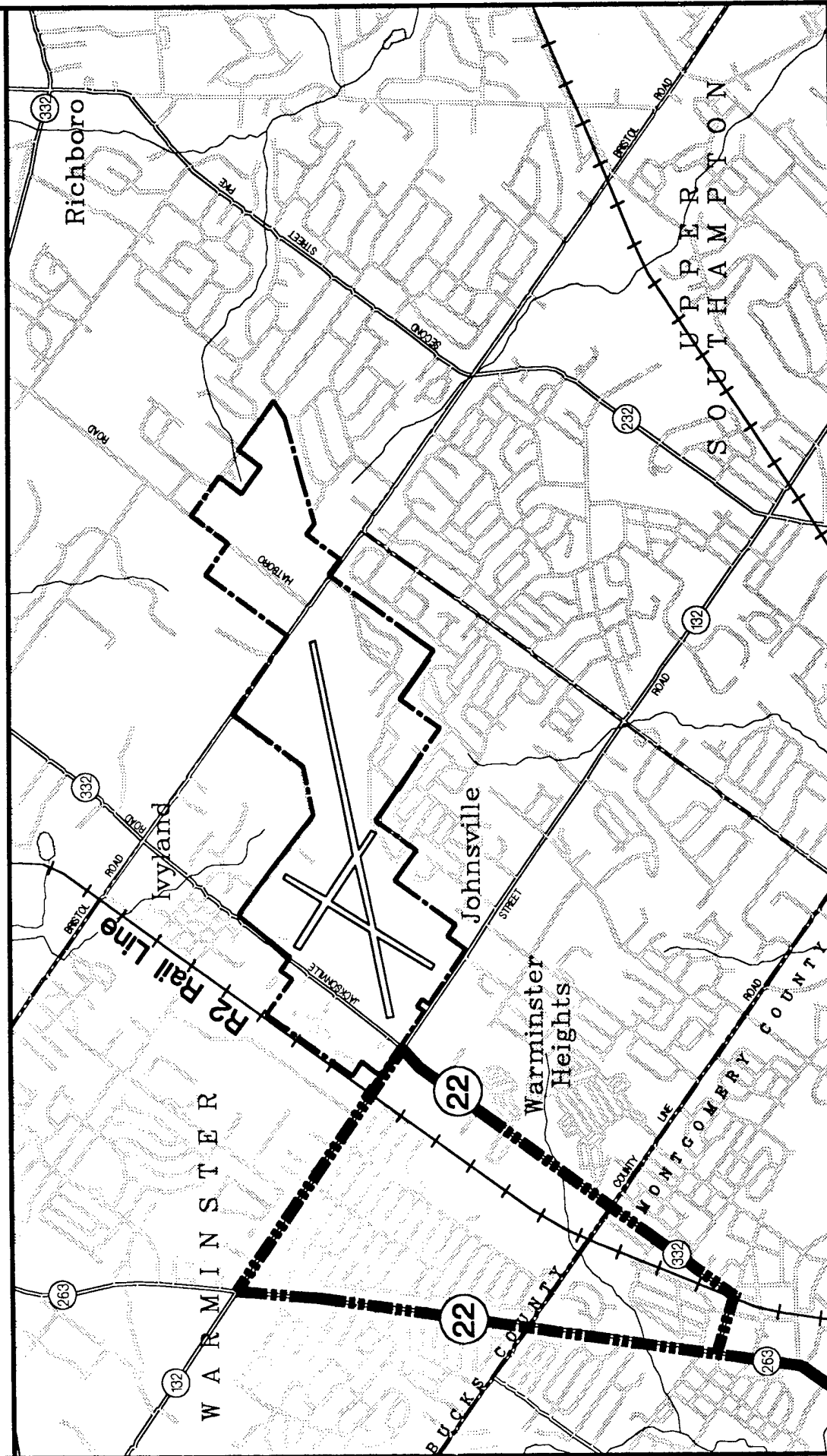
3.4.2 Public Transportation

The project area is served by Southeastern Pennsylvania Transportation Authority (SEPTA) public transportation. Both bus and rail service are available. The bus and rail lines in the study area are presented in Figure 3.4-4 (Public Transportation).

The No. 22 bus line runs adjacent to NAWCAD with a stop on Jacksonville Road outside the main gate to the base. The No. 22 bus runs south from Warminster into central Philadelphia with several transfers available. During the am peak period, six scheduled arrivals to Warminster occur at 6:27, 7:00, 7:16, 7:36, 8:19, and 8:59 am. During the pm peak period, six scheduled departures from Warminster occur at 3:22, 3:44, 4:07, 4:39, 5:22, and 5:52 pm.

The project area is also served by the R2 rail line, which runs between Warminster and Center City Philadelphia. The Warminster Station is approximately one-half mi (0.80 km) from the base. During the am peak period, three scheduled arrivals to Warminster occur at 5:55, 7:38, and 8:19 am. During the pm peak period, three scheduled departures from Warminster occur at 3:38, 4:36, and 5:40 pm.

Public Transportation



- NAWCAD Property Boundary
- + Rail Line
- Bus Line

Figure 3.4-4

3.5 Air Quality

3.5.1 National Ambient Air Quality Standards

The US Environmental Protection Agency (USEPA), under the requirements of the 1970 Clean Air Act (CAA) as amended in 1977 and 1990, established primary and secondary standards for six criteria pollutants, known as the National Ambient Air Quality Standards (NAAQS) (Table 3.5-1). The primary standards are intended to protect the public health. The secondary standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare. The NAAQS were established for the following six pollutants:

- Carbon monoxide (CO) is a colorless, odorless gas. The major source of CO in an urban area is the incomplete combustion of fuels used to power vehicles, heat buildings, and process raw materials, and the residence from burning refuse. Carbon monoxide is a site-specific pollutant; major concentrations are found near the source, such as at heavily congested intersections. Carbon monoxide is the most commonly occurring air pollutant. The health effect associated with CO-contaminated air is reduced transport of oxygen by the blood stream, a consequence of CO displacing oxygen in hemoglobin. Exposures to very high levels of CO are lethal, and exposures to high levels for a short duration can cause headaches, drowsiness, or loss of equilibrium.
- Sulfur dioxide (SO₂) is emitted into the atmosphere from the combustion of sulfur-bearing fuels for space heating and motor vehicles. The use of low sulfur fuels for space heating has reduced the amount of sulfur dioxide emitted from these sources. The combustion of gasoline and diesel fuels in motor vehicles accounts for a very small percent of the total sulfur dioxides emitted. Respiratory illness and damage to the respiratory tract are the health effects associated with inhalation of sulfur dioxide emissions.
- Nitrogen dioxide (NO₂) is a yellowish-brown, highly reactive gas, typically present in an urban environment. Major sources of nitric oxide and nitrogen oxide emissions are fuel combustion in boilers associated with electric utilities and industrial facilities. Nitric oxides oxidize in the atmosphere to form nitrogen dioxide. Nitrogen oxides cause irritation to the lungs, bronchitis and pneumonia, and lowered resistance to respiratory infections.
- Ozone (O₃) is a photochemical oxidant and a major constituent of smog. Hydrocarbons and nitrogen oxides are precursor pollutants to the formation of ozone. Hydrocarbons and nitrogen oxides react in the presence of sunlight to form a photochemical oxidant. This reaction is time-dependent and usually takes place far downwind from the site where the contaminants were originally emitted. Thus, hydrocarbons and nitrogen oxides are reactive

Table 3.5-1

Federal and Pennsylvania Ambient Air Quality Standards

Pollutant	Averaging Period	Pennsylvania Standards	Federal Standards	
			Primary	Secondary
Carbon Monoxide	8-hour 1-hour	9 ppm 35 ppm	10 mg/m ³ 40 mg/m ³	10 mg/m ³ 40 mg/m ³
Ozone	1-hour	235 ug/m ³	235 ug/m ³	235 ug/m ³
Nitrogen Dioxide	1-year	100 ug/m ³	100 ug/m ³	100 ug/m ³
Lead	3-month	1.5 ug/m ³	1.5 ug/m ³	1.5 ug/m ³
PM10	1-year 24-hour	50 ug/m ³ 150 ug/m ³	50 ug/m ³ 150 ug/m ³	50 ug/m ³ 150 ug/m ³
Sulfur Dioxide	1-year 24-hour 3-hour	80 ug/m ³ 365 ug/m ³ 1300 ug/m ³	80 ug/m ³ 365 ug/m ³	1300 ug/m ³

contaminants, whose impact generally occurs well beyond the areas immediate to the source. High concentrations of ozone are a major health and environmental concern. For example, ozone is a principal cause of lung and eye irritation in an urban environment.

- Particulate matter in an urban environment typically occurs as a result of incomplete fuel combustion. Particulate matter includes dust, dirt, soot, smoke, and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, and fires. Diesel fuel compared to gasoline contributes more particulates to the atmosphere. An inhalable particulate is defined as a particulate that is less than ten micron (PM10) in diameter. The major health effect caused by the inhalation of PM10 is damage to the respiratory organs.
- Lead (Pb) is a bluish-gray metal, usually found in small quantities in the earth's crust. The most significant contributors of lead emissions to the atmosphere are gasoline additives, iron and steel production, and alkyl lead manufacturing. Other sources of lead include combustion of solid waste, windblown dust from weathering of lead-based paint, and cigarette smoke. The use of lead-free gasoline has considerably reduced the lead levels in the urban environment. Exposure to lead is dangerous for the fetus and results in pre-term birth. Other health effects associated with lead exposure are decreased intelligence quotient (IQ) for infants and small children, increased blood pressure in middle-aged men, and brain and kidney damage in adults and children.

The project area is located in Bucks County, Pennsylvania, which is presently designated by USEPA as a severe nonattainment area (i.e., not meeting the NAAQS) for ozone. The county is in attainment for the other criteria pollutants.

3.5.2 Mobile Sources

Local CO concentrations are estimated through the use of computerized mathematical models, since data on street level CO concentrations in urban areas is not at a level of detail relevant for most projects. Using the models, worst case CO levels are calculated for the peak one-hour and eight-hour time periods, corresponding to the averaging periods of the state and federal ambient CO standards.

Generally, the CO concentrations that occur at any one site result from a contribution of several emission sources. Ambient CO concentrations have two components: the local source contribution (i.e., vehicles on the roadway[s] next to the analysis site) and background. The CO levels due to local roadway source contribution are dependent on traffic and operating conditions (e.g., volumes, speeds).

The background CO concentration is a function of land use, land use density, and transportation-related activity in the general community, as opposed to the specific localized sources. Background

CO levels at the project site are not available. Based on the recommendation of the Pennsylvania Department of Environmental Protection (August 24, 1995), air monitoring data collected for the city of Philadelphia during 1993 were conservatively used as background levels for this project. These one-hour and eight-hour monitoring background values are 5.0 parts per million (ppm) and 3.3 ppm, respectively. It is recommended by the agency that these background values be used for both existing year and future year analyses, since no estimation of future background is currently available.

The CO concentration from local traffic is determined in two steps. First, emissions from vehicle exhausts are calculated. Assumptions about meteorological conditions are then used to calculate the concentrations of CO in the air. The Pennsylvania Department of Environmental Protection provided the site-specific required inputs for emissions estimation. The composite emission factors were calculated using the USEPA Mobile 5A computer model. The idle emission rates were calculated by multiplying the speed of 2.5 mi (4 km) per hour by the exhaust emission factors obtained from the Mobile 5A computer run with that speed. This method to determine the idle emission rates at intersections is one of the conservative methods recommended by USEPA.

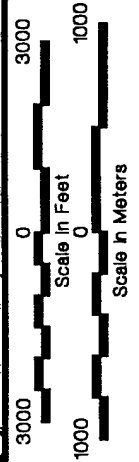
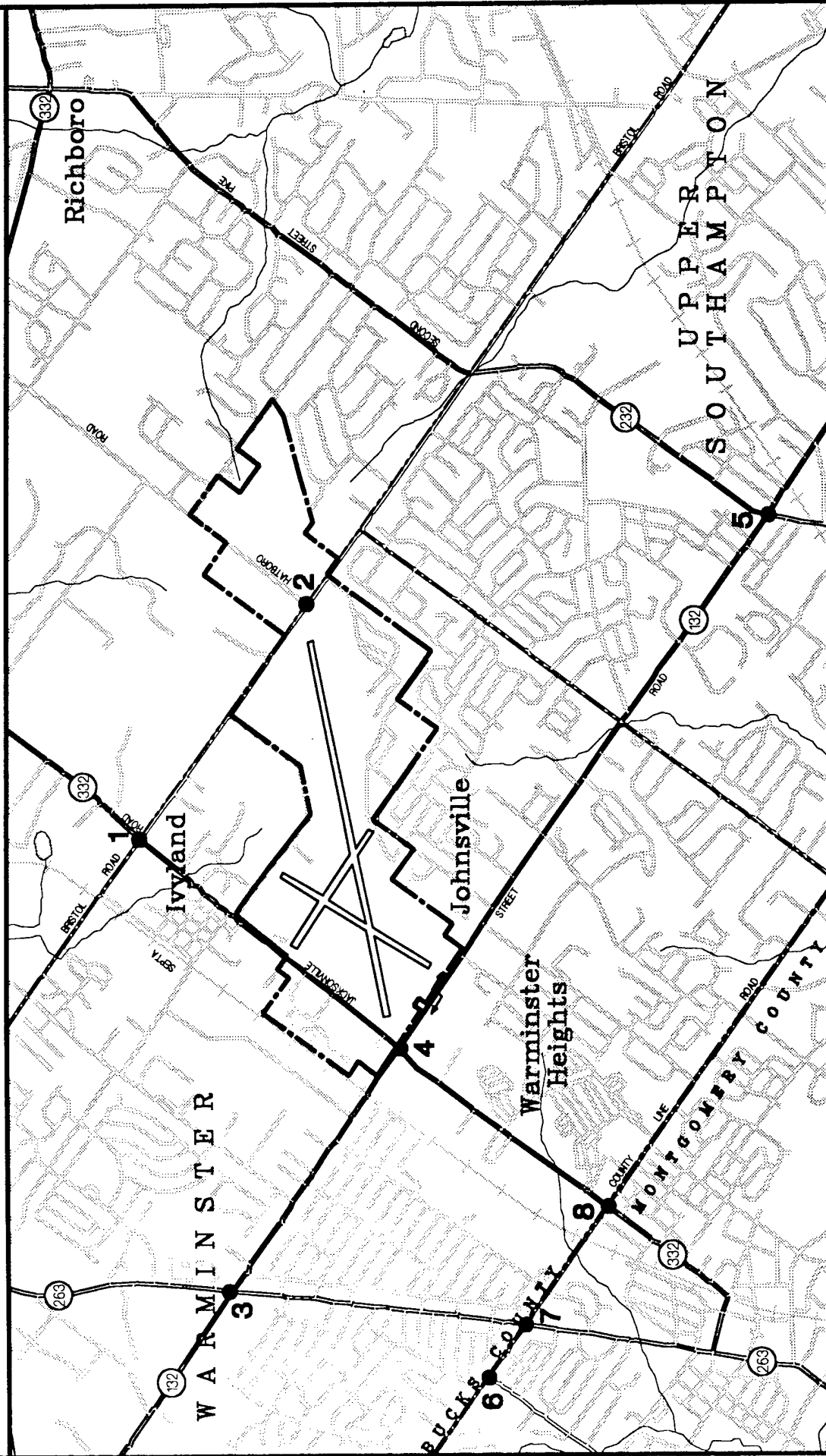
Carbon monoxide concentrations due to vehicles were then calculated by using the USEPA's CAL3QHC computer dispersion model. The concentrations determined by using this model are a function of such input parameters as wind speed, wind direction, and atmosphere stability class. (The parameters used in this study are based on the recommendations provided in *Guidelines for Modeling Carbon Monoxide from Roadway Intersections* [USEPA, November 1992].

Eight intersection receptor sites were selected where CO concentration impacts were estimated. They were chosen based on consideration of where the maximum changes in traffic patterns would occur. The receptor locations are shown in Figure 3.5-1 (Air Modeling Receptor Locations), and results of the computer modeling are presented in Table 3.5-2. Concentrations shown are for the pm peak period, which were higher than the am period, except Jacksonville Road/County Line Road where the am was higher. Based on this analysis, no current violations of the one-hour and eight-hour CO standards were found. Exceedances of the eight-hour CO standard were found at the intersections of York Road/Street Road, Jacksonville Road/Street Road, and York Road/County Line Road.

3.5.3 Stationary Sources

Comprehensive air pollutant emission studies of stationary sources were conducted at NAWCAD (Haliburton NUS, December 1994) to quantify actual and potential emissions of all criteria and hazardous air pollutants (HAPS) emitted at NAWCAD during the base year 1992. This information was intended to determine the compliance status of NAWCAD with respect to existing air regulations of the Pennsylvania Department of Environmental Protection, as well as to quantify the potential

Air Modeling Receptor Locations



- Air Modeling Receptor Location
- NAWCAD Property Boundary

Figure 3.5-1

Table 3.5-2

Existing Carbon Monoxide Levels

Receptor	One Hour (ppm)	Eight Hour (ppm)
Jacksonville Road/Bristol Road	9.4	6.4
Hatboro Road/Bristol Road	8.3	5.6
York Road/Street Road	16.5	*11.4
Jacksonville Road/Street Road	14.5	*10.0
Second Street Pike/Street Road	12.1	8.3
Blair Mill Road/County Line Road	12.6	8.6
Old York Road/County Line Road	14.1	*9.7
Jacksonville Road/County Line Road	12.0	8.2
Notes: 1. Levels include 1995 background concentrations of 5.0 ppm (1-hour) and 3.3 ppm (8-hour). 2. Pennsylvania standard is 35 ppm for 1-hour and 9 ppm for 8-hour averaging periods. Federal standard is 40 ppm for 1-hour and 10 ppm for 8-hour averaging periods. 3. * = standards exceedance		

impact of regulations to be promulgated by the USEPA in response to mandates contained in the 1990 Clean Air Act Amendments (CAAA).

Since most emission sources are used on an intermittent basis, there is wide disparity between actual and potential emissions. Potential emissions are generally based on the use of equipment for an entire year (24 hours per day for 365 days, or 8,760 hours per year), or for some lesser amount of time if enforceable permit restrictions are in place. Since air pollution regulations are generally based on potential emissions, both values were calculated in the survey.

The NAWCAD emission inventory revealed a total of 116 discrete point sources and fugitive (i.e., not discharged to the atmosphere in a confined flow stream [dust or particulate matter]) sources of air pollution. Table 3.5-3 provides actual emission rates for the principal pollutant categories. The sources include:

- Boilers, furnaces, and fireplaces;
- Above and below ground storage tanks;
- Generators and fire pumps;
- Paint spray booths;
- Abrasive blasting machine;
- Electroplating tanks;

- Vented salt spray tanks;
- Degreasers;
- Woodworking equipment connected to a cyclone;
- welding equipment used in conjunction with a hood;
- incinerator and an air stripper;
- the auto repair shop;
- the ejection seat tower;
- the Fire Protection Group corrugated testing shed and the burn pit
- the wastewater treatment plant; and
- the application of pesticides and herbicides.

Actual emissions of volatile organic carbon (VOC) at NAWCAD were estimated to be 15 tons per year (tpy) (13 metric tpy), while actual emissions of NO_x were estimated to be 14 tpy (13 metric tpy). The emission potential of these pollutants, based on year-round operation, are 101 and 451 tpy (92 and 409 metric tpy), respectively. Given the magnitude of these potential emissions, the existing NAWCAD would be considered a major source under Title I of the CAAA.

In addition to criteria pollutants, NAWCAD sources emit 46 HAPs as defined in Title III. These compounds are released through the use of solvent cleaning compounds, welding operations, the combustion of fuel oil and the use of other miscellaneous compounds throughout the facility. The HAPs emitted during the base year 1992 are listed in Table 3.5-4.

Actual total HAP emissions from all sources at the NAWCAD in 1992 were estimated at 2 tpy (1.8 metric tpy), while potential HAP emissions are estimated at 15 tpy (14 metric tpy). These figures indicate that NAWCAD would not be classified as a major source of HAPs under Title III of the 1990 CAAA.

Air Permits

NAWCAD has permits, as required by the Pennsylvania Department of Environmental Protection, for Boiler No.1, Boiler No.3, the classified materials incinerator, and the pathological incinerator. The permits for the classified materials incinerator and Boiler No. 1 will expire in March 1999. The permit for Boiler No. 3 expired in March 1994; a renewal application is currently filed with the Pennsylvania Department of Environmental Protection. Boiler No. 2 does not require a permit (grandfather clause). The pathological incinerator has been inactive for more than ten years and is no longer permitted. Additionally, NAWCAD has filed a Synthetic Minor Air Permit application with the Pennsylvania Department of Environmental Protection under federal Clean Air Act Amendment guidelines.

Table 3.5-3

NAWCAD Emissions Summary

Pollutant	Actual Emission (tpy)		Potential Emission (tpy)	
	TPY	MTPY	TPY	MTPY
CFCs	1.38	1.25	not available	not available
HAPs	2.04	1.86	14.66	13.30
CO	7.76	7.04	665.68	603.90
NO _x	13.99	12.69	451.11	409.25
PM10	2.26	2.05	100.56	91.23
SO	5.23	4.74	162.27	147.21
VOC	15.03	13.64	100.50	91.17
Lead	0.03	0.03	0.03	0.03
Source: Haliburton NUS, December 1994				

Table 3.5-4

NAWCAD HAP Emissions

Acetaldehyde	Ethyl Benzene	Nickel
Acrolein	Ethylene Glycol	4-Nitrophenol
Antimony	Formaldehyde	Phenol
Arsenic	Glycol Ethers	Polycyclic Organic Matter
Benzene	Hexanen	Propionaldehyde
Beryllium	Hydrochloric Acid	Selenium
Biphenyl	Hydrofluoric Acid	Styrano
Bis Phthalate	Hydroquinone	Tetrachloroethylene
1,3-Butadiene	Lead	Toluene
Cadmium	Manganese	1,1,1-Trichloroethane
Chlorobenzene	Mercury	2,2,4-Trimethylpentane
Chromium	Methanol	Xylenes
Cumene	Methyl Ethyl Ketone	m-Xylenes
Dibenzofurans	Methylene Chloride	o-Xylenes
2,4-Dinitrotoluene	Methyl Naphthalene	p-Xylenes
1,4-Dioxane		
Source: Haliburton NUS, December 1994		

3.5.4 Clean Air Act Conformity

The Clean Air Act Amendments (CAAA) of 1990 expand the scope and content of the Act's conformity provisions by providing a more specific definition. As stipulated in Section 176(c) of the CAAA, conformity is defined as "conformity to the State Implementation Program's (SIP) purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards." Conformity further requires that such activities will not:

- (1) Cause or contribute to any new violations of any standards in any area;
- (2) Increase the frequency or severity of any existing violation of any standards in any area; or
- (3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The USEPA published final rules on general conformity that apply to federal actions in areas designated nonattainment for any of the criteria pollutants under the CAA (40 CFR Parts 51 and 93 in the November 30, 1993 *Federal Register*). The proposed rules provide specific de minimus emission levels by pollutant to determine the applicability of conformity requirements for a proposed project. For a severe ozone nonattainment area, such as the area in which NAWCAD is located, 25 tons (22.7 metric tons) per year of VOC or nitrogen oxide (NO_x) is the de minimus criterion.

However, the final rule also defines a series of exemptions under 40 CFR 93.153 (Applicability). In particular, the general conformity rules are not applicable to the proposed Reuse Plan and under Exemption XIX in 40 CFR Part 153(c), which reads:

"Actions (or portions thereof) associated with transfers of land, facilities, title, and real properties through an enforceable contract or lease agreement where the delivery of the deed is required to occur promptly after a specific, reasonable condition is met, such as promptly after the land is certified as meeting the requirements of CERCLA, and where the federal agency does not retain continuing authority to control emissions associated with the lands, facilities, title, or real properties."

3.6 Noise

3.6.1 Noise Fundamentals and Methodology

Noise pollution in an urban environment comes from numerous sources. Some noise pollution is caused by activities essential to the health, safety, and welfare of the community's inhabitants, such as emergency vehicle sirens, garbage collection operations, and construction and maintenance equipment. Other sources of noise, such as traffic, stem from the movement of people and goods, activities that are essential to the viability of a community as a place to live and do business. Although these and other noise-producing activities are necessary to modern life, the noise they produce is undesirable and detracts from the quality of the living environment.

Ways to Measure Noise

A number of factors affect sound as it is perceived by the human ear. These include the actual level of the sound (or noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels during exposure. Levels of noise are measured in units called decibels. Since the human ear cannot perceive all pitches or frequencies equally well, these measures are adjusted or weighted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. This adjusted unit is known as the A-weighted decibel, or dBA. The A-weighted network de-emphasizes both very low- and very high-pitched sound, so the measured levels correlate well with the human perception of loudness.

Human response to changes in noise levels depends on a number of factors, including the quality of the sound, the magnitude of the changes, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely with the individual, as does response to the perceived changes. Generally, changes in noise levels less than three dBA will barely be perceptible to most listeners, whereas a ten dBA change normally is perceived as a doubling (or halving) of noise levels. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Since the dBA noise metric describes a noise level at just one moment, and very few noises are constant, other ways of describing noise over extended periods are needed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific time period, as if it had been a steady, unchanging sound. For this condition, a descriptor called the equivalent sound level, L_{eq} , can be computed. The L_{eq} descriptor is the constant sound level that, in a given situation and time period (e.g., one-hour L_{eq} or 24-hour L_{eq}), conveys the same sound energy as the actual time-varying sound. Statistical sound level descriptors such as L_1 , L_{10} , L_{50} , L_{90} , and L_x are also sometimes used to indicate noise levels that are exceeded 1, 10, 50, 90, and x percent of the time, respectively.

Alternatively, it is often useful to account for the difference in response of people in residential areas to noises that occur during sleeping hours as compared to waking hours. A descriptor, the day-night noise level (L_{dn}), defined as the A-weighted average sound level in decibels during a 24-hour period with a ten dB weighting applied to nighttime sound levels, is a widely-used indicator for such evaluations. The ten dB weighting accounts for the fact that noises at night sound louder because there are usually fewer noises occurring at night. The L_{dn} descriptor has been proposed by the US Department of Housing and Urban Development (HUD), USEPA, and other organizations as one of the most appropriate criteria for estimating the degree of nuisance or annoyance that increased noise levels would cause in residential neighborhoods.

The maximum one-hour equivalent sound level (one-hour L_{eq}), the 24-hour equivalent sound level (24-hour L_{eq}), and the day-night noise level (L_{dn}) have been selected as the noise descriptors to be used in the noise impact analysis of this project. Maximum one-hour equivalent sound levels were used to provide an indication of highest expected sound levels.

3.6.2 Noise Standards and Criteria

There are a number of standards and guidelines adopted by federal agencies for assessing noise impacts that are reviewed in this EIS. Although these regulations and standards do not specifically apply to this project, they are useful to review in that they provide both a characterization of the quality of the existing noise environment as well as a measure of project-induced impacts.

Federal Highway Administration (23 CFR 772)

The Federal Highway Administration (FHWA) noise regulations require that a noise analysis be conducted for all highway projects (FHWA, 1974). These standards contain noise abatement criteria that the FHWA considers to be the acceptable limits for noise levels for exterior land uses and outdoor activities and for certain interior uses (Table 3.6-1). The FHWA noise abatement criteria lists developed land use types as Categories A, B, C, or E. In this EIS, Category B, which includes residences, schools, and churches, would represent most of the sensitive receptors that lie in proximity to the proposed project. Future noise levels are predicted to evaluate the extent of impact in relation to the noise abatement criteria. If these criteria are exceeded, or if there is a substantial increase above the existing noise level, abatement measures are considered. Such measures are to be taken for all project alternatives.

HUD Environmental Criteria and Standards

HUD has adopted environmental standards, criteria, and guidelines for determining acceptability of federally-assisted projects, and has proposed mitigation measures to ensure that activities assisted

Table 3.6-1
FHWA Noise Abatement Criteria

Activity Category	$L_{eq}(h)$	$L_{10}(h)$	(Description of Activity Category)
A	57 (exterior)	60 (exterior)	Land for which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	70 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	75 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	—	—	Undeveloped lands.
E	52 (interior)	55 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.
<p>Note: The L_{eq} and L_{10} designations represent hourly A-weighted sound levels expressed in decibels (dBA). Either $L_{10}(h)$ or $L_{eq}(h)$ (but not both) may be used on a project.</p> <p>Source: US Department of Transportation, FHWA, 1974.</p>			

Table 3.6-2
HUD Site Acceptability Standards

Noise Zone	Day/Night Sound Level (L_{dn})
Acceptable	Not exceeding 65 dB
Normally Unacceptable	Above 65 dB but not exceeding 75 dB
Unacceptable	Above 75 dB
Source: 24 CFR Part 51.	

by HUD will achieve the goal of a suitable living environment. Although these guideline values are strictly advisory, they represent valid goals for any project.

HUD assistance for the construction of new noise-sensitive land uses is generally prohibited for projects with Unacceptable noise exposure and is discouraged for projects with Normally Unacceptable (as defined in Table 3.6-2) noise exposure with suitable mitigating measures. This policy applies to all HUD programs for residential housing, college housing, mobile home parks, nursing homes, and hospitals. It also applies to HUD projects for land development, new communities, redevelopment, or any other provision of facilities and services that is directed to making land available for housing or noise-sensitive development.

Sites falling within the Normally Unacceptable zone require implementation of additional sound attenuation or reduction or other mitigation measures: five dB if the L_{dn} is greater than 65 dB but does not exceed 70 dB, and ten dB if the L_{dn} is greater than 70 dB but does not exceed 75 dB. If the L_{dn} exceeds 75 dB the site is considered Unacceptable for residential use.

HUD encourages noise attenuation features in new construction or in alterations of existing structures. The HUD-mandated or recommended design mitigation measures to eliminate or minimize Unacceptable or Normally Unacceptable levels, respectively, include well-sealed double-glazed windows, forced-air ventilation systems (which permits windows to remain closed in summer), and acoustic shielding and insulation.

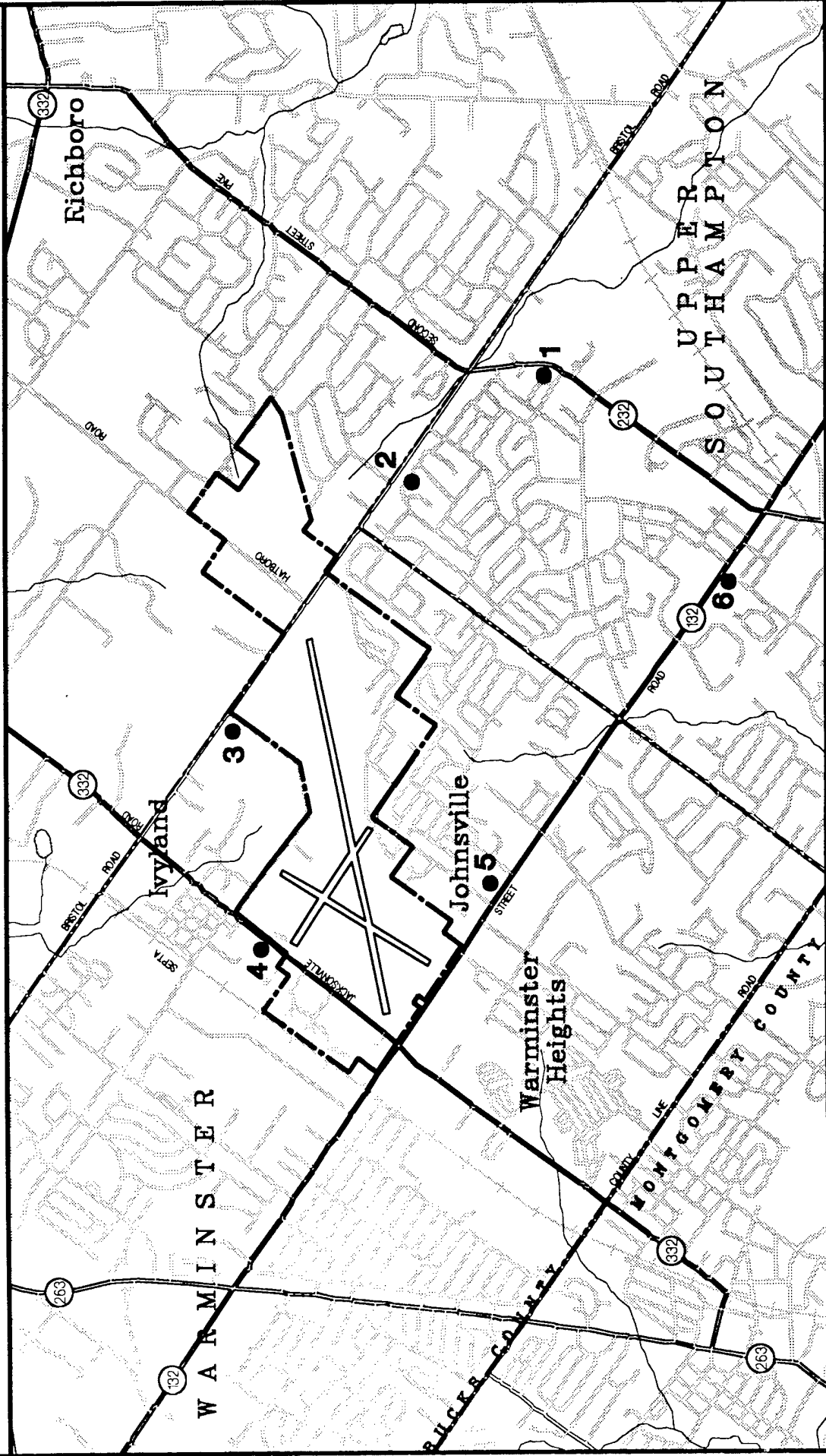
3.6.3 Noise Monitoring

A noise measurement survey was conducted in the study area. Receptors were selected based on noise sensitivity, such as residential and open space use. All receptors were adjacent to streets where there could be increases in traffic due to implementation of the proposed project. Receptors along Davisville Road (which intersects the project area) were not included since no project-generated traffic would be added to Davisville Road during the build year. The key receptor locations that could experience noise impacts as a result of traffic increases are those residences along the perimeter roads of the project area.

Six monitoring locations were selected to provide an indication of the existing noise levels (Figure 3.6-1, Noise Monitoring Locations). A sampling measurement program was conducted at Sites 1 through 6 during four time periods on March 29th and August 15th and 16th, 1995. Measurements were taken five ft (1.5 m) from the existing building walls of the receptor locations. Microphone height for all receptors was eight ft (2.4 m) above ground level.

Site 1 1430 Second Street, between Street Road and Bristol Road. The receptor is located on the west side of Second Street, just south of Bristol Road. The receptor is on a

Noise Monitoring Locations



● Receptor Location
 --- NAWCAD Property Boundary

Figure 3.6-1

residential stretch of Second Street, away from the commercial center to the south along Street Road. The microphone was located five ft (1.5 m) from the building wall and approximately 40 ft (12 m) from the centerline of Second Street. Second Street is a two-way street with one lane in each direction and a narrow six-ft (1.8-m) shoulder.

- Site 2 440 Bristol Road, between Whitney Road and Second Street. The receptor is located on the south side of Bristol Road, just east of Second Street. The microphone was located five ft (1.5 m) from the building wall and approximately 50 ft (15 m) from the centerline of Bristol Road. Bristol Road is a two-way street with one lane in each direction and no shoulder.
- Site 3 236 Bristol Road, between Hatboro Road and Jacksonville Road. The receptor is located on the south side of Bristol Road, just east of Jacksonville Road. The microphone was located five ft (1.5 m) from the building wall and approximately 50 ft (15 m) from the centerline of Bristol Road. Bristol Road is a two-way street with one lane in each direction and no shoulder.
- Site 4 1230 Jacksonville Road, between Bristol Road and Street Road. The receptor is located on the west side of Jacksonville Road, just south of Bristol Road. The microphone was located five ft (1.5 m) from the building wall and approximately 50 ft (15 m) from the centerline of Jacksonville Road. Jacksonville Road is a two-way street with one lane in each direction and no shoulder.
- Site 5 375 Street Road, between Newton Road and Centennial Road. The receptor is located on the north side of Street Road, just east of Newton Road. There are two additional residences adjacent to the receptor, which is on a large commercial segment of Street Road. The microphone was located five ft (1.5 m) from the building wall and approximately 60 ft (18 m) from the centerline of Street Road. Street Road is a two-way street with five lanes of traffic and there is a shoulder on each side of the road.
- Site 6 Residence at intersection of Lowell Road and Street Road (the only residence at the intersection, at the northeast corner). The receptor is located on the south side of Street Road. Street Road is still a commercial road and there is a cluster of residential homes that are adjacent to Lowell Road. The microphone was located five ft (1.5 m) from the building wall and approximately 60 ft (18 m) from the centerline of Street Road. Street Road is a two-way street with five lanes of traffic and there is a shoulder on each side of the road.

The field monitoring program was conducted using the following equipment:

- Bruel & Kjaer Type 2231 Precision Sound Level Meter;
- Bruel & Kjaer Type 2218 Graphic Printer;
- Bruel & Kjaer Type 4230 Sound Level Calibrator;
- Bruel & Kjaer Type 4133 ½ inch microphone; and,
- Bruel & Kjaer Type 2614 microphone preamplifier.

Measurements at each sampling location were made on the A-scale (dBA) for a sampling period of 30 minutes. A wind screen was used to minimize wind noise across the face of the microphone. The data were digitally recorded by the noise analyzer and displayed at the end of the measurement period.

3.6.4 Existing Noise Levels

The one-hour equivalent noise levels (one-hour L_{eq}) measured at Sites 1 through 6 are presented in Table 3.6-3. At all measurement locations, the predominant source of noise is vehicular traffic. The measured noise levels are common for residential areas, reflecting the level of vehicular traffic present. While not directly compatible, the HUD and FHWA criteria provide a useful yardstick by which to assess the existing noise environment in the study area:

- The HUD criterion for residential land use is exceeded when the L_{dn} exceeds 65 dBA. Based on existing noise levels the, $L_{dn} = 65$ is exceeded at sites 4, 5, and 6.
- The FHWA criterion for Activity Category B land uses (residential, parkland, hospitals, etc.) is 67 dBA. Existing noise levels exceed the FHWA criteria at Site 5 during 7 to 8 am period and 4 to 6 pm period the am and pm hours and Site 6 during the 7 to 8 am hour. Both sites are adjacent to heavily-traveled streets that experience large traffic volumes. At the other four sites, the existing noise levels do not exceed the FHWA criteria; however, the measured ambient levels at all receptors reflect typical levels for suburban areas.

Table 3.6-3
Existing Sound Levels - Sites 1 Through 6

Time Period	One-Hour L_{eq} in dBA					
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
AM Peak (7 - 9 am)	65	65	64	64	67	67
Midday (10am - 2pm)	64	63	63	63	65	64
PM Peak (5 - 7 pm)	65	64	65	65	68	67
Pre-Midnight (9pm-12 am)	61	58	62	63	64	63
24-Hour L_{eq}	62	62	62	62	65	64
L_{dn}	65	64	65	66	68	67

3.7 Infrastructure

This chapter describes the various utility systems at NAWCAD, and is based on the description of utilities documented in *Proposed Realignment Implementation Plan for the Naval Air Warfare Center Aircraft Division* (US Navy, October 1994).

3.7.1 Electricity

All electricity is purchased from the PECO Energy at 33 kilovolts (kv). NAWCAD is billed in accordance with rate schedule HT (high tension) from PECO Energy. There are 13 emergency generators at NAWCAD, providing a total capacity of 1,525 kilowatts (kw). An alternate 33-kv service from PECO Energy has been installed, which can be used to restore electrical power if the normal service connection fails for an extended period.

The electrical distribution system serving the majority of NAWCAD is a radial system comprised of ten feeders from the main substation. Each feeder serves multiple buildings. Distribution throughout NAWCAD is underground in concrete-encased four-inch (in) (ten-cm) ducts, and is armored cable, tray-overhead inside Bldgs 1 and 2. There is a separate HT service to the family housing and Bldg 108 areas. There are 13 separate secondary power services which go to various out-buildings and utility functions.

3.7.2 Steam Production

Steam is used for space heating, hot water, and auxiliary services. The steam supply consists of one distribution system that is fed from a central plant in Bldg 1. The central steam plant capacity of 97,000 lbs/hr is provided by three boilers that are fired by either oil or natural gas fuels. The NAWCAD has a winter and a summer steam distribution system. Winter supply lines range in size from 12 in (30 cm) to one in (three cm). Summer lines, used for domestic hot water heating and air-conditioning reheat, range in size from eight in (20 cm) to one in (three cm). Bldgs 1, 2, 3, 4, 26, 125, and 138 are supplied via two 12-in (30-cm) lines at 13 pounds per square inch (psi) during the winter. The remainder of the complex is supplied by a five-in (13-cm) line at 25 psi during the winter. Several outlying buildings have their own boilers and are not connected to the steam system. Summer steam is furnished to Bldgs 1, 2, 3, 70, 71, and 72.

3.7.3 Water Supply

NAWCAD purchases potable water from the Warminster Municipal Authority to serve the married enlisted housing area and the Inertial Guidance Facility at Bldg 108. All other water needs are supplied from existing wells on NAWCAD property.

Ten wells provide water to NAWCAD. The main usable wells are 1, 2, 3, 4, and 10. All water from wells 3, 4, and 10 are pumped to a 35,000-gallon (132,475-liter) reservoir in Bldg 3. This ensures adequate chlorine contact time. From the reservoir it is pumped to a 200,000-gallon (757,000-liter) elevated tank. Water flows through the distribution system from this tank. Wells 1 and 2 are used for fire protection and are pumped to a 200,000-gallon (757,000-liter) ground tank and a 100,000-gallon (378,500-liter) elevated tank (Kurdziel, June 26, 1996).

3.7.4 Sanitary Sewer System

Wastewater collection and treatment at NAWCAD consists of a small, mostly gravity, collection system and a 1.0-million-gallon (3.8-million-liter) per day (mgd) sanitary wastewater treatment facility. Since the majority of NAWCAD wastewater operations are essentially in one interconnected building complex, the wastewater collection system is largely indoor plumbing. The sewer system consists of about 16,000 ft (4,900 m) of gravity pipe ranging in size from six to 12 in (15 to 30 cm).

The sanitary waste water treatment plant provides primary and secondary treatment. Raw influent is pumped to four primary settling tanks, where it flows by gravity to one of three trickling filters. From the trickling filters, it flows to four settling tanks and then to a chlorine contact chamber. All treated effluent then enters a small unnamed tributary of Little Neshaminy Creek (Kurdziel, June 26, 1996).

NAWCAD has had two National Pollution Discharge Elimination System (NPDES) permits to discharge treated effluent from the on-site sewage treatment plant. The discharge criteria set forth in the NPDES permits have not been consistently met, particularly for ammonia and nitrogen. A consent decree was entered in the United States District Court of Pennsylvania on May 1, 1992 in which the Navy agreed to send a portion of the sanitary wastewater to the publicly-owned treatment works operated by the Warminster Municipal Authority. As a result, a sewer line was constructed from Bldg 6 along the western boundary of the site, tapping into the township line at Street Road. This tap-in allows approximately 20,000 gallons per day [gpd] [76,000 liters per day] of raw sanitary waste to be sent to Warminster Township's sewage treatment plant (Kurdziel, June 26, 1996), as per a Warminster Township Municipal Authority permit issued to NAWCAD.

3.7.5 Industrial Waste System

Historically, industrial wastes generated by the existing facilities were pre-treated in a two-stage treatment system consisting of three batch-operated 45,000-gallon (170,325-liter) holding/treatment tanks. While no industrial pre-treatment is performed, wastewaters from the boilers and cooling towers still flow to this part of the sewage treatment plant. From the batch tanks, this wastewater is directed to the sanitary portion of the plant (Kurdziel, June 26, 1996).

3.7.6 Storm Sewer System

There are two main storm sewers at NAWCAD. One discharges into an underground storage box culvert located at the southwest end of the complex, then into an unnamed tributary of Pennypack Creek. The second system, located at the northeast end of the complex, discharges into an unnamed tributary of Little Neshaminy Creek. Both of these systems are considered inadequate for a two-year storm event.

Smaller systems are located at the northern end of the complex along Kirk Road and at the southeast end of the site near the Navy family housing area. The system along Kirk Road discharges into a small, unnamed tributary of Little Neshaminy Creek. The other system discharges into a small unnamed creek. Storm sewer lines vary from six to 42 in (15 to 107 cm) in size.

NAWCAD is located within the Little Neshaminy watershed. Bucks County has a total of eight major watersheds. While a stormwater management plan has yet to be prepared for the Little Neshaminy watershed, a plan has been approved by the Pennsylvania Department of Environmental Protection for one other watershed in the county (the Neshaminy Creek watershed). The methodology and standards developed in the Neshaminy Creek plan are anticipated to be used as prototypes for the development of stormwater management plans for the other watersheds in the county (Bucks County Planning Commission, 1993). The plan presents specific hydrological release rates to address the reduction of hydrologic impacts, and includes mandatory water quality criteria.

3.7.7 Solid Waste

NAWCAD is in compliance with the Pennsylvania Department of Environmental Protection solid waste management regulations. Solid waste generated by NAWCAD is currently disposed of offsite by a private contractor, who is required to follow federal, state, and local regulations. Recycling efforts at NAWCAD include precious metals recovery, scrap metal recycling, high grade (computer) paper recycling, and plain paper recycling.

3.7.8 Natural Gas

Natural gas is purchased from PECO Energy. It is used in the boiler room located between Bldgs 1 and 2, as well as the barracks, the Inertial Guidance Facility, Bldg 108, Shenandoah Woods, and the six housing units for officers located on Jacksonville Road.

3.7.9 Telephone

The NAWCAD owns all of the telephone lines on the property. It leases equipment from AT&T and has a contract to keep the system operational.

3.8 Cultural Resources

The Navy undertook an intensive level historic resources survey and a Phase I archaeological survey (TAMS Consultants, Inc., 1995) in compliance with:

- Sections 106 and 110 of the National Historic Preservation Act (NHPA) of 1966, as amended;
- Executive Order 11593, *Protection and Enhancement of the Cultural Environment*;
- OPNAVINST 5090.1B, *Environmental and Natural Resources Program Manual*; and
- NEPA.

These laws and regulations require that cultural resources meeting the eligibility criteria of the National Register of Historic Places be identified and evaluated. Consequently, the overall objectives of the intensive level historic resources survey were to establish the historic context of NAWCAD, and to evaluate each building and structure with respect to National Register criteria. The objectives of the Phase I Archaeological survey were to determine the presence or absence of intact archaeological resources and to develop appropriate recommendations for future studies, if necessary.

3.8.1 Overview of Prehistoric, Contact, and Historic Periods

Prehistoric and Contact Period

Prehistoric sites recorded in Bucks County have been associated primarily with Archaic and Woodland Period occupation of the region. Most of the recorded sites are along major river floodplains and low-order streams. In the vicinity of NAWCAD, recorded sites are along the Neshaminy and Little Neshaminy Creeks (Shoemaker, 1944; Custer and Wallace, 1982). These sites typically include lithic scatters found in cultivated fields and on slopes along streambeds. Most of the recovered projectile points have been manufactured from quartzite, quartz, argillite, and jasper and date from the Archaic and Early Woodland Periods, based on the styles and the manufacturing techniques of the points collected.

Early Settlement of Warminster Township

NAWCAD is located in the Warminster Township community known as Johnsville. Settled in the 1680s, Johnsville was originally called Upper Corner. It was renamed Johnsville in 1814 by James

Craven. Major landowners in the Johnsville area whose holdings included substantial portions of the present day NAWCAD property were the Hart and Longstreth families. Descendants of these families distinguished themselves in the early history of Bucks County.

One Hart descendent, Colonel Joseph Hart, was the Sheriff of Bucks County. Colonel Hart's homestead played a small role in the Revolutionary War, as Continental soldiers camped on the Hart farm and the Battle of the Crooked Billet crossed through Hart's land. This battle is notable as it represents the first and only independent campaign assigned to the Pennsylvania Militia (Bailey, 1976).

In 1817, another Hart heir, John Hart III, built a farmhouse on property south of what is now Bristol Road, between Jacksonville and Newtown Roads. This house presently serves as the commander's quarters at NAWCAD—Quarters A (Bldg 100). The initials of John Hart and his wife are still visible on the house's northeast wall and it has an unusual arched basement with a stone floor. The structure is located close to the line of retreat taken by American troops in the 1778 Battle of the Crooked Billet, and it has been suggested that a former outbuilding on the property may have been used as a hospital during the Revolutionary War (Casele, 1995).

In 1787 John Longstreth built a stone farmhouse and barn on his property. This structure is known as Bldg 101 (Quarters B) at NAWCAD and includes a barn and a fruit cellar bulkhead in addition to the wood frame and stone house (Bailey, 1986). A family burial plot was said to be located behind this house, but no evidence of a cemetery was observed on the property in May 1995 (Casele, 1995).

During the 19th and early 20th centuries, the extensive Johnsville land holdings of the Harts and Longstreths were gradually subdivided and sold. However, with a few exceptions (Florrey Brick Company and the Beans Agricultural Implement Factory), the area remained largely undeveloped and in agricultural use until the purchase and subsequent construction of an aircraft assembly plant and an industrial airport in Johnsville by the Brewster Aeronautical Corporation in 1939.

Brewster Aeronautical Corporation

James Work purchased the aircraft division of the Brewster Manufacturing Company in 1932, merging it with Work Engineering Corporation, to form the Brewster Aeronautical Corporation (obituary in files of Delaware Valley Community College). Brewster Aeronautical was successful in developing several Navy aircraft, including a dive bomber (Bermuda/Buccaneer), and the Buffalo, the Navy's first single-wing, all-metal fighter plane.

In 1941, the Brewster Aeronautical Corporation announced plans to construct a new \$5 million plant in Bucks County. Using loans guaranteed by the federal Reconstruction Finance Corporation, and later the Defense Plant Corporation, the company purchased 367 acres of land in Warminster Township, forming the core of the site that is now NAWCAD Warminster. To construct the new plant, all structures were removed from the property except Bldg 100 (Quarters A).

The new factory and hangars were designed by the Philadelphia architectural firm of Silverman and Levy (Doylestown Intelligence, January 23, 1941). The design incorporated some modern features, including subassembly and assembly lines arranged ergonomically for women workers. The six assembly lines at the Johnsville plant were each capable of producing a plane a day. All test flights were to be flown at Johnsville (Doylestown Intelligence, January 23, 1941). Actual aircraft production began in December 1941.

Brewster Aeronautical experienced severe labor problems throughout World War II and in 1942; its operations were briefly taken over by the Navy. Despite the removal of James Work as president in 1942 and the subsequent election of western industrialist and labor innovator, Henry J. Kaiser, as Chairman of the Board of Brewster in March 1943, labor problems continued. The company was investigated by both the Senate's Truman Committee and the House Naval Affairs subcommittee from 1943 through 1944. In November 1943, the Navy canceled its dive bomber contract with Brewster and the assembly lines were retooled for production of the Chance Vought-designed Corsair. From December 1943 through cancellation of its Navy contract in spring 1944, Brewster was able to meet its production quota for Corsairs.

The Navy Era at Warminster

In July 1944, the Navy took over Brewster's lease with the Defense Plant Corporation, placing it under the command of the Naval Air Material Center. It was redesignated as the Naval Aircraft Modification Unit (NAMU) and given the mission of developing guided missiles and modifying service model airplanes and helicopters, the latter for air-sea rescue (*Air Scoop*, January 1946). In 1944, NAMU was used to test the Gorgon, a ship-to-air missile intended as a defense against Kamikaze planes.

After World War II, NAWCAD underwent a series of reorganizations and expansions. With research responsibilities increasing, NAWCAD purchased land for an extension of the facility's east-west runway in 1951. NAWCAD acquired Bldg 101 (Quarters B) in this land purchase. Other Navy functions were subsequently relocated to Johnsville, including research labs from Mustin Field in Philadelphia (1963), three laboratories from the Naval Air Engineering Center in Philadelphia (1967), and the Naval Strategic Systems Navigation Facility from Brooklyn, New York (1973). Significant facilities developed or installed at NAWCAD as part of its research missions include the Typhoon computer system, the centrifuge, the inertial guidance testing facility, and the ejection tower. Each of these facilities is described below.

The Typhoon Computer System

In July 1950, NAWCAD acquired the world's largest analog computer, the Typhoon, designed by RCA Laboratories in Princeton, New Jersey. This computer was placed in the Aeronautical Computer Laboratory (*NAWCAD Reflector*, April 1976). The Typhoon had the ability to handle a three-dimensional guided missile flight problem with a rate of accuracy surpassing any other computer

at the time. Although most of its actual use was cloaked in Cold War secrecy, it was apparently a critical element in the design and development of the US military's first rockets and may have been involved in the development of the Polaris missile. The Typhoon remained in constant use until 1962 (*Naval Aviation News*, 1955; *Avionics*, 1950, *Annals of the History of Computing*, 1993).

The Centrifuge and the US Space Program

The Aviation Medical Acceleration Laboratory (AMAL), established in 1949, was responsible for testing the effects of flight-encountered G forces, acceleration, and deceleration on humans, using a huge centrifuge. Driven by a 4,000-horsepower DC motor, the centrifuge (Bldg 70) could simulate near-space altitudes of 125,000 ft (38,000 m) by accelerating loads of up to 400 pounds (lbs) (181 kilograms [kg]) to 40 Gs in 6.5 seconds. It consisted of a gondola mounted on power-driven gimbals attached to a 50-ft (15-m) arm. The gondola was oblong in shape and ten ft (three m) in diameter. At the time of its construction, the centrifuge was the largest in the world (*Naval Aviation News*, November 1955). It was also considered unique because it could simulate the multiple stresses (heat, altitude, sound, and light) to which a pilot was subject when in space or a high performance aircraft (*Approach*, 1974).

Use of the centrifuge was critical in the development of the US space program in the 1950s and 1960s. The first such project involved a simulator for the X-15. NAWCAD's successful experience with the X-15 program led to work under Project Mercury. Acceleration tests using the centrifuge were instrumental in the design of the contour couch used in the Mercury spacecraft. In August 1959, each of the seven Mercury astronauts spent two weeks at Johnsville practicing simulated liftoff and reentry. The centrifuge was used by the astronauts again in 1960.

In 1964, the centrifuge was modified for Project Gemini testing by installing a new arm, and a larger gondola capable of carrying up to three people. New gimbals were also added to allow for the acceleration of 1,000 lbs (454 kg) up to 40 G in just under seven seconds (*Reflector*, April 1964). NAWCAD's centrifuge was used to test instrument displays and controls for the Gemini spacecraft and to train four Project Gemini astronauts (Trimble, 1990).

Inertial Guidance Test Facility

In 1964, an inertial guidance testing facility (Bldg 108) was constructed at NAWCAD as part of the Aeronautical Instruments Laboratory (AIL). Researchers at the facility worked on navigational systems for both aircraft and submarines (*Reflector*, February 1963), making the AIL a key facility in developing and testing navigation systems for Cold War weapons systems such as advanced aircraft and ballistic and cruise missiles.

The Ejection Tower

In 1976, a 150-ft (46-m) tall red and white tripod tower was moved to NAWCAD from the Philadelphia Naval Shipyard (Structure 361). This test tower was used to evaluate the effectiveness

of aircrew equipment, principally ejection seats, during simulated aircraft crashes. The vertical section of the structure, the deceleration tower, was added in the 1960s and used to simulate crash forces (*Naval Aviation News*, July 1976).

3.8.2 Intensive Level Historic Resources Survey

A program of documentary research was conducted on the history of NAWCAD and the general history of military aviation and military housing to place the facility in an appropriate historic context. Sources used in the preparation of the historic period overview and historic context included local histories, contemporary periodicals, administrative records of NAWCAD Warminster, and historic maps. Repositories consulted included the following:

- Engineering Societies' Library, NY;
- New York Public Library, NY;
- Sterling Memorial Library, Yale University, New Haven, CT;
- Avery Memorial Architectural Library, Columbia University, NY;
- Bucks County Historical Society, Bucks County Conservancy, Bucks County Courthouse, Doylestown, PA;
- Naval Historical Center, Washington Navy Yard;
- National Archives Main Branch, Washington, DC;
- Public Affairs Office and Technical Library, NAWCAD Warminster;
- Delaware Valley Community College Library Archives;
- Pennsylvania Bureau of Historic Preservation, Harrisburg, PA; and
- NAAR Regional Archives, Van Pelt Library, University of Pennsylvania, Philadelphia PA.

A review of the National Register files at the Pennsylvania Bureau of Historic Preservation in May 1995 showed that no architectural or archaeological cultural resources within the NAWCAD property boundaries were listed in the National Register. The files did reveal that in July 1984, National Register Nomination Forms were submitted to the Advisory Council on Historic Preservation by the Navy (Petrone, 1984) for Bldg 100 (Quarters A) and Bldg 101 (Quarters B). A month later the Navy requested a determination of eligibility for these buildings. At that time, the files on Bldgs 100 and 101 were sent to the Pennsylvania State Historic Preservation Officer (SHPO). The SHPO responded that insufficient information was available to determine the structures' eligibility and requested further research.

Upon completion of the documentary research for the current intensive level historic resources survey, a vehicular and pedestrian field examination was conducted to obtain a visual assessment of the project area in the context of the background research. Each building or structure that appeared to potentially meet the Secretary of the Interior's Criteria for Historic Significance (36 CFR 60.4) as

shown in Table 3.8-1 was recorded on a Cultural Resource Survey Form K. The research and field examinations indicated that certain structures and buildings at NAWCAD would be considered important under three areas of significance used by the National Register of Historic Places: Military, Architecture, and Engineering. Accordingly, the recommended historic contexts for the properties are:

- Development of Naval Aviation;
- Naval Missile Design;
- Inertial Guidance Systems;
- Anti-Submarine Warfare, all from World War II to the Cold War (1942-1989); and
- Man in Space (1959-1965).

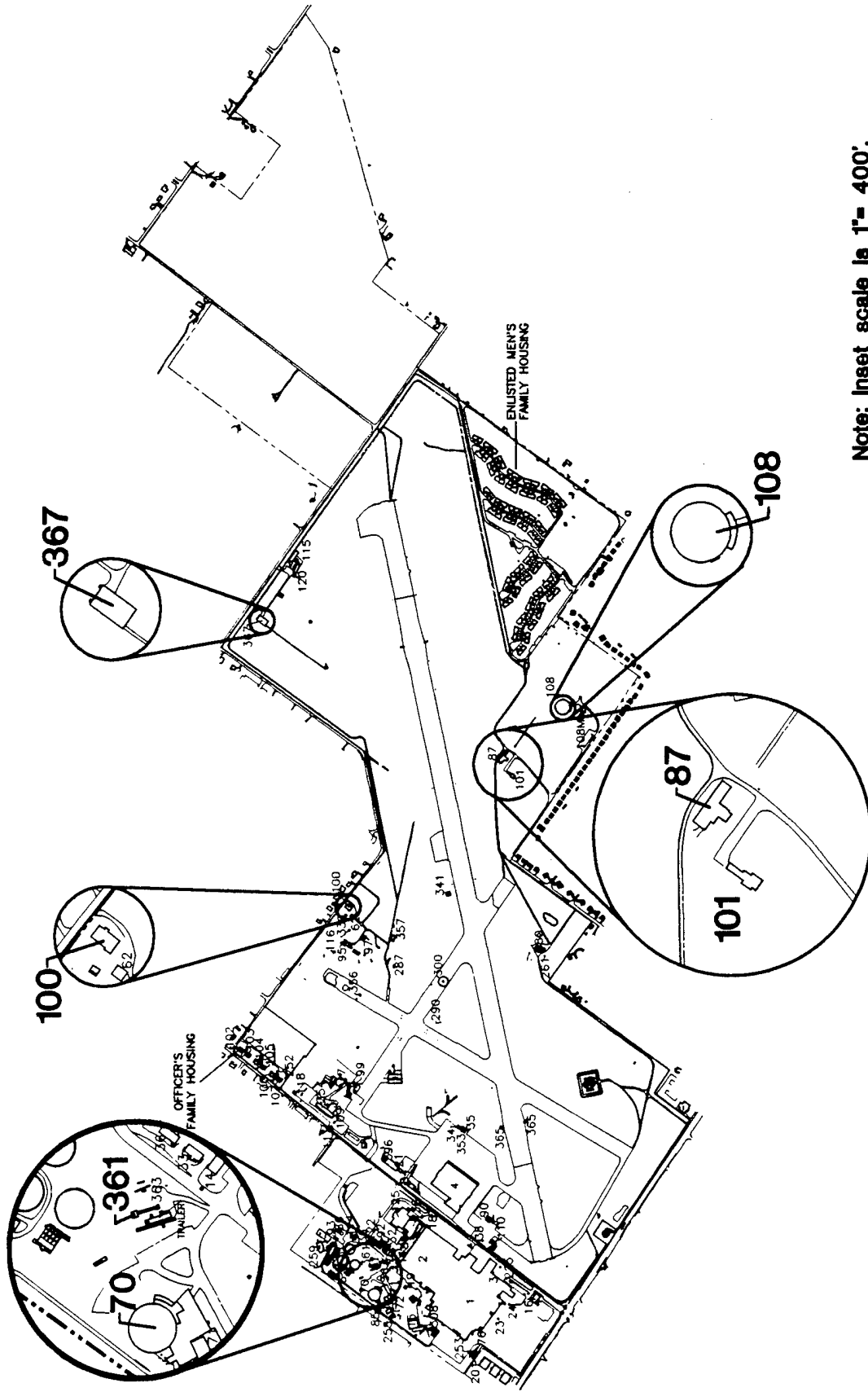
Each building or structure at NAWCAD was then evaluated on the basis of whether it possessed: (1) physical or associative characteristics significantly related to the historic contexts (above); and (2) a sufficient degree of historic integrity as defined by the National Park Service guidelines (Table 3.8-2) to be a good representative of its property type. Buildings that met these criteria were recommended eligible for the National Register. Buildings or structures that did not meet these requirements were recommended not eligible.

Several NAWCAD buildings appear to individually possess the required historic or architectural importance necessary to be eligible for listing in the National Register under Criterion I.C (Figure 3.8-1, National Register Eligible Properties at NAWCAD): Bldg 100 (Quarters A), Bldg 101 (Quarters B), and Bldg 87 (Quarters B barn). With their careful treatment of classical details, and relatively fine craftsmanship, these buildings are the embodiment of their respective styles and demonstrate the development of domestic architecture in lower Bucks County during the period 1750-1820.

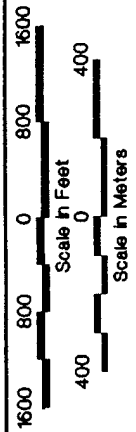
National Park Service regulations (36 CFR 60.4[g]) preclude consideration of resources less than 50 years old for the National Register unless such resources are of "exceptional importance." The background research showed that several of the structures at NAWCAD were crucial in the development of Naval aviation technology during the Cold War and should be considered eligible for the National Register under the historical significance Criteria I.A and I.C despite their being less than 50 years of age.

Four buildings should be considered under Criterion I.A: inertial guidance research facility (Bldg 108), seat ejector test facility (Structure 361), elevated aircraft support tower (Structure 367), and centrifuge (Bldg 70). The centrifuge (Bldg 70) played such an important role in the development of the X-15, as well as the Mercury and Gemini manned space programs, it should be considered eligible under Criterion I.A in the context of Man in Space.

National Register Eligible Properties at NAWCAD



Note: Inset scale is 1"= 400'.



Building and Number
 Eligible Structure
 Property Boundary

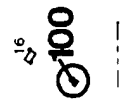


Figure 3.8-1

Table 3.8-1

Criteria for Historic Significance

36 CFR 60.4, Part I	
The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:	
A.	that are associated with events that have made a significant contribution to the broad patterns of our history; or
B.	that are associated with the lives of persons significant in our past; or
C.	that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D.	that have yielded, or may be likely to yield, information important in prehistory or history.
36 CFR 60.4, Part II	
Ordinarily cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:	
A.	a religious property deriving primary significance from architectural or artistic distinction or historical importance; or
B.	a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
C.	a birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life; or
D.	a cemetery which derives its primary significance from graves or persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or
E.	a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or
F.	a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or
G.	a property achieving significance within the past 50 years if it is of exceptional importance.

Table 3.8-2
Integrity Types Defined

Type of Integrity	Property Must Have the Following Attributes:
Location	the property must not have been moved.
Design	must retain historic elements that create the form, plan, space, structure, and style of the property.
Setting	the setting of the property must retain its historic character.
Workmanship	methods of construction from its time of significance must be evident.
Materials	must retain the key exterior materials dating from the period of its historic significance.
Feeling	the physical features of the property must convey its historic character.
Association	property must be the actual place where a historic event or activity occurred and must be sufficiently intact to convey that relationship to an observer.
Source: US Department of the Interior, 1991.	

Three of the four buildings meeting Criterion I.A also would be eligible under Criterion I.C as good examples of advanced engineering testing structures built during the period of significance: ejection seat testing facility (Structure 361), centrifuge (Bldg 70), and the avionics testing facilities (Structure 367).

Following the evaluation of individual building eligibility, an assessment was made regarding the potential for an historic district at NAWCAD. According to National Park Service guidelines, an historic district must possess “a significant concentration, linkage, or continuity of sites, buildings, or objects united historically or aesthetically by plan or physical development” (US Department of the Interior, 1991). As noted in the historic overview, many buildings at NAWCAD were constructed during World War II when the facility served as an aircraft manufacturing plant. These buildings are thus united historically by plan and physical development. Given NAWCAD’s important role in labor relations and aircraft construction during World War II, the period of significance for a potential historic district would be defined as beginning with the construction of the plant in 1942 and continuing to the end of the war. However, for a district to retain integrity, the majority of its components cannot have been substantially altered since the period of the district’s significance (US Department of the Interior, 1991).

The field examination of NAWCAD revealed that due to extensive renovation and remodeling, coupled with an aggressive facade and window replacement program conducted by the Navy in 1991, no additional buildings and structures have survived with any degree of integrity. For example, all of the major structures associated with the Brewster era (Bldgs 1 to 4) have lost their original exterior appearance and most of the accessible interiors have been gutted several times during their occupation. Older warehouses and ancillary buildings, such as Bldgs 15 and 16, have been covered in new facade materials. Furthermore, new buildings have been constructed on the property, creating modern intrusions, so that NAWCAD hardly conveys the sense of a historic environment. A few buildings, mostly warehouse and sewage treatment facilities (Bldgs 6, 14, 32, 33, 36, 92, 204-206, 209-211) have survived largely untouched. However, due to changes in their surroundings, they have lost their context and can no longer convey any sense of the original historic environment. Also, these structures are not sufficiently important examples of their building type to be considered individually eligible.

In summary, all but a handful of buildings have lost their integrity of design, setting, workmanship, materials, and feeling-- six of the seven necessary attributes of integrity. Loss of integrity to this degree would generally cause most properties at NAWCAD to be ineligible for listing in the National Register. Consequently, there is no potential historic district at NAWCAD.

3.8.3 Phase I Archaeological Survey

A review of the Pennsylvania Archaeological Site Survey (PASS) files at the Pennsylvania Historical and Museum Commission revealed no previously recorded prehistoric or historic period archaeological sites within the boundaries of the project area. However, five prehistoric sites have been recorded within one mile of the NAWCAD property. In addition, at least ten prehistoric sites have been recorded along the Little Neshaminy Creek basin, located two mi (3.2 km) north of the NAWCAD property. None of these sites has been listed in or determined eligible for the National Register. The records also indicated that three Phase I archaeological surveys have been conducted within three mi (4.8 km) of the project area.

An examination of the records for the identified sites revealed that approximately a dozen Archaic and Woodland Period lithic scatters have been identified near low-order streams within the general vicinity of the NAWCAD property. The five prehistoric sites within one mile of NAWCAD Warminster all contained surface scatters of points and waste flakes from the Archaic and Woodland Periods. The location of these sites near streams is consistent with predictive models for the Piedmont that expect post-Middle Archaic sites to be found near ephemeral streams and on or next to stream and river floodplains (Custer and Wallace 1982). It is likely that low-order creeks in the area were traversed during the prehistoric period, and therefore impart at least low to moderate potential for prehistoric sites.

To identify the potential for intact archaeological resources at NAWCAD, a field survey was performed according to the Pennsylvania Bureau for Historic Preservation *Guidelines for Archaeological Investigations* (1991). During the field survey, it was observed that soils at NAWCAD have been extensively disturbed by the construction of industrial and scientific facilities by the Brewster Aeronautical Corporation after 1939 and the US Navy since 1944; performance of hazardous waste remediation activities; and installation of subsurface utilities. As a result of these disturbances, most original soils have been relocated with a consequent probable loss of integrity of most archaeological sites potentially located within NAWCAD property boundaries.

In contrast, field inspection of soils surrounding Bldgs 100 (Quarters A) and 101 (Quarters B) indicated that they have been minimally disturbed by the construction activities that characterize the remainder of the NAWCAD facility. Therefore, it is likely that historic period archaeological resources associated with the construction and domestic use of these structures may be located in the yard areas surrounding both buildings. These resources may provide important information about the lives of Bucks County farming families during the late 18th and the entire 19th centuries as well as information regarding use of the properties by industrial staff and Navy personnel both during and after World War II. It is also possible that a family burial plot was located behind Quarters B as recently as the 1930s or 1940s, and that evidence of a Revolutionary War battle may be present near Quarters A.

These structures may, therefore, be potentially eligible for the National Register due to their potential to provide important information about the lives of Bucks County farmers and their families during the historic period, as well as for the information each may provide about the industrial and military use of these properties during and after the World War II era. Since these sites' above-ground resources have been identified as eligible, a Phase IB is recommended to determine if there are also below-ground resources.

Archaeological investigations of the World War II-era buildings associated with the Brewster Aeronautical Corporation and US Navy's early laboratories are unlikely to yield new information about the technology or material culture of this era in American history. Extensive subsurface disturbance to these areas also precludes the existence of intact archeological remains. Consequently, these areas possess no potential for the presence of intact, significant archeological resources, and no further investigation of these areas is planned.

3.9 Natural Resources

3.9.1 Biological Resources

Vegetation

The vegetation at NAWCAD was originally characterized by a mixed hardwood forest. The valuable wood was logged in the 1800s and cleared for agriculture. Since that time, the post-World War II suburban growth of metropolitan Philadelphia and continued farming have combined to maintain a very small amount of forested land on and in the area of NAWCAD.

Today, the site is vegetated by large areas of maintained turf grass lawns in the area of the runways and taxiways, ornamental tree and shrub species, opportunistic tree, shrub and herbaceous species, cropland, and by naturally occurring but highly degraded woods. Ornamental tree and shrub species are located primarily in the developed areas along Jacksonville Road, with some incidental plantings along the public roads beyond the runway areas.

The extreme eastern portion of the site has not been developed or used by NAWCAD and is currently farmland. The area south of the airfield contains a mixture of ornamental tree plantings including European larch (*Larix decidua*), Norway spruce (*Picea abies*), eastern white pine (*Pinus strobus*) and ornamental cherry (*Prunus* sp.), as well as natives including black cherry (*Prunus serotina*), pin oak (*Quercus palustris*), white ash (*Fraxinus americana*), yellow poplar (*Poplar tulipifera*), and sassafras (*Sassafras albidum*). These species were observed on the airfield side of Orion Road.

The other side of Orion Road is the on-site housing for military personnel and their families. Behind the housing facility is a remnant woodland that is highly degraded. The canopy layer is dense and averages approximately 40 to 50 ft (12 to 15 m) in height. The dominant trees in this area are yellow poplar (*Poplar tulipifera*), white ash (*Fraxinus americana*), hickory (*Carya* sp.), and red maple (*Acer rubra*). A portion of the woodland understory has been removed to facilitate a cookout/recreation area. The remaining degraded understory is dominated by poison ivy (*Rhus toxicodendron*) and catbriar (*Smilax* sp.) with a maze of bike and hiking trails located throughout.

Wildlife

Open space and woodland habitats occur on-site. The open space habitats are characterized by maintained turf lawns with ornamental and opportunistic tree and shrub species, and farmland at the extreme eastern portion of the site. Woodland habitat occurs just south of the family housing development.

Threatened and Endangered Species

No federal or state listed threatened or endangered species have been identified as existing on or near the NAWCAD facility (Pennsylvania Natural Diversity Inventory, October 1995), nor have any been observed. No critical habitat for threatened and endangered species was observed at the site.

3.9.2 Wetlands

The National Wetlands Inventory (NWI) map for the study area identifies three wetland areas (comprising less than five acres [two hectares]) within the boundary of NAWCAD (Figure 3.9-1, National Wetlands Inventory):

- a palustrine open water, intermittently exposed/permanent (POWZ) wetland;
- a palustrine forested, broad-leaved, deciduous, temporary (PFO1A) wetland; and a
- a portion of a palustrine scrub/shrub, broad-leaved deciduous, temporary (PSS1A) wetland.

According to the Bucks County Soil Survey, two hydric soils occur on-site: Bowmansville (Bo) and Doylestown (DoA) series.

An on-site wetland reconnaissance was performed on August 15 and 16, 1995. Most of the site was found to be dry with the exception of the area identified on the NWI map as the PSS1A wetland, on the extreme eastern portion of the site.

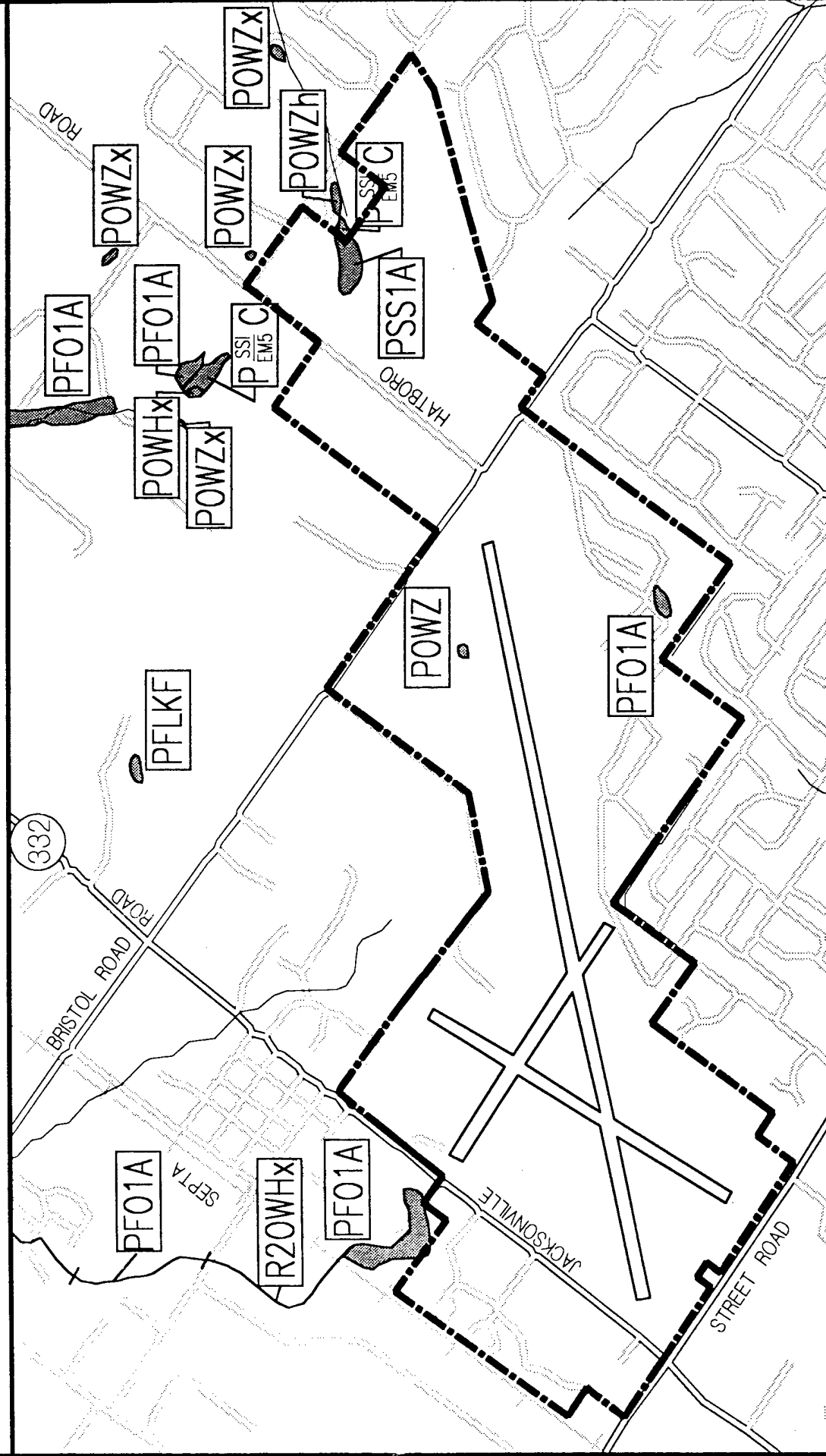
The existing background information, coupled with the field reconnaissance, indicates that a small acreage of wetlands (approximately one to five acres [0.4 to 2 hectares]) occurs on site. A formal wetland delineation would be required to determine the exact acreage of on-site wetlands.

3.9.3 Floodplains

Much of the natural drainage pattern of the site has been altered by development. Most of the precipitation that falls on the developed areas of the site is collected and discharged by a storm sewer system to an unnamed tributary of Little Neshaminy Creek (US Navy, February 1991). Because NAWCAD is a federal facility, it is not depicted on the National Flood Insurance Program's Flood Insurance Rate Maps (FIRM). Based upon a review of the information presented on the FIRM maps for the surrounding areas, the facility does not lie within the 100-year or 500-year floodplain.

Responding to a major flood in 1955, Bucks County instituted a flood warning system and constructed eight flood control dams in the Neshaminy Creek Basin in the 1960s. Since then, the

National Wetlands Inventory



POWZ
 NWM Mapping Unit
 --- NAWCAD Boundary

Source: National Wetlands Inventory, 1981.

Figure 3.9-1

county's approach to flood control and stormwater management has paralleled national trends, with the emphasis changing from major structural flood control measures to more comprehensive stormwater management approaches (Bucks County Planning Commission, 1993). As mentioned in subchapter 3.7, while a stormwater management plan has yet to be prepared for the Little Neshaminy watershed (the watershed within which NAWCAD lies), a plan has been approved by the Pennsylvania Department of Environmental Protection for one other watershed in the county, the Neshaminy Creek watershed. The methodology and standards developed in the Neshaminy Creek plan are anticipated to be used as prototypes for the development of stormwater management plans for the other watersheds in the county (Bucks County Planning Commission, 1993). The plan presents specific hydrological release rates to address the reduction of hydrologic impacts.

3.9.4 Topography, Geology, and Soils

Topography

The topography of the NAWCAD site is flat with some moderately rolling hills. The runway divides the site in half, east to west, with elevations dropping to the north and south. The flat terrain elevation ranges from a low of 297 ft (91 m) above sea level along the northern boundary of the RDT&E complex to the highest elevation on site of 377 ft (115 m), near the eastern end of the runway (US Navy, February 1991). The on-site slope averages two to three percent, with one area (north of the fence of the RDT&E complex between the SEPTA rail line and Jacksonville Road) that has a slope exceeding 15 percent.

Geology

The NAWCAD site lies within the Triassic Lowland section of the Piedmont province. The underlying bedrock is composed of consolidated sedimentary rock, primarily Stockton shales and sandstones deposited on ancient alluvial fans. The Stockton formation is the oldest sedimentary deposit in the Triassic age Newark Group. Resting upon older rocks and overlain by the Lockatong lithofacies, the Stockton is cut by a well-developed system of joints and is extensively faulted (US Navy, February 1991).

Soils

According to the Bucks County Soil Survey, the NAWCAD site is comprised of the following soil series: Urban Land/Landsdale, Chalfont, Lawrenceville, Penn-Klinesville, Readington, Ducannon, Bowmansville, and Doylestown. The Urban Land/Landsdale and Ducannon soil series are upland soils that occur near the center of the site, from the eastern end of the runway to the west, including the RDT&E complex. These two soils cover approximately one-third of the site.

Bowmansville and Doylestown soils are listed as hydric soils, characterized by poor drainage, a high water table, and slow permeability. A small amount of these soils is located in the farm field on the northeast side of the site and along the site boundary on the south side of the site, near the housing facility and the western side of the airfield. Although these soils are topographically located in lower areas of slope, no areas appeared wet or ponded during the August 1995 field reconnaissance. The remaining four soil series are upland soils and cover approximately two-thirds of the site.

3.10 Petroleum and Hazardous Substances

3.10.1 Hazardous Waste/Substance Management

NAWCAD has a Hazardous Material Control and Management Program, consisting of a Hazardous Material Control Committee and an authorized Hazardous Material Use List (BRAC Cleanup Team and EA Engineering, March 1995). This program includes a continuing review of materials presently in use in order to identify less hazardous substitutes. An inventory of laboratory chemicals, quantities, and locations is maintained at the activity. In addition, NAWCAD undergoes periodic environmental compliance audits that assess compliance with applicable federal and state environmental regulations. Environmental inspections are performed by the Northern Division of the Naval Facilities Engineering Command, USEPA, and the Pennsylvania Department of Environmental Protection.

NAWCAD had been classified as a Large Quantity Generator (RCRA Hazardous Waste Generator No. PA6170024545) under the Resource Conservation and Recovery Act (RCRA) (BRAC Cleanup Team and EA Engineering, March 1995). A Large Quantity Generator is defined as a facility that generates over 1,000 km per month of acutely hazardous waste. Hazardous waste generation has been steadily declining however, and will eventually be reduced to zero (other than small amounts generated from routine maintenance operations) (Kurdziel, August 31, 1995). Currently, wastes generated by the facility are disposed of by Defense Reutilization and Marketing Office (DRMO) contractors in compliance with RCRA and the Pennsylvania Department of Environmental Protection regulations.

3.10.2 Hazardous Waste Remediation

Information contained in this section was based upon the *Environmental Baseline Survey* (EA Engineering, 1995), the *Base Realignment and Closure Cleanup Plan* (BRAC Cleanup Team and EA Engineering, 1995), and the CERFA report prepared for NAWCAD (US Navy, 1993). These documents summarize the status of the facility's environmental restoration and associated environmental compliance programs and present a comprehensive strategy for implementing response actions necessary to protect human health and the environment and facilitate property transfer. Environmental restoration programs at NAWCAD include the Installation Restoration Program (IRP) and Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Compliance programs include regulation of:

- Underground Storage Tanks (USTs) per RCRA Subpart I and Pennsylvania Department of Environmental Protection regulations;
- Polychlorinated Biphenyls (PCBs) by the Toxic Substances Control Act (TSCA);

- Air emissions per the Clean Air Act;
- Discharge to the surface water per the National Pollutant Discharge Elimination System (NPDES); and
- Asbestos, lead-based paint, and radon per Navy regulations.

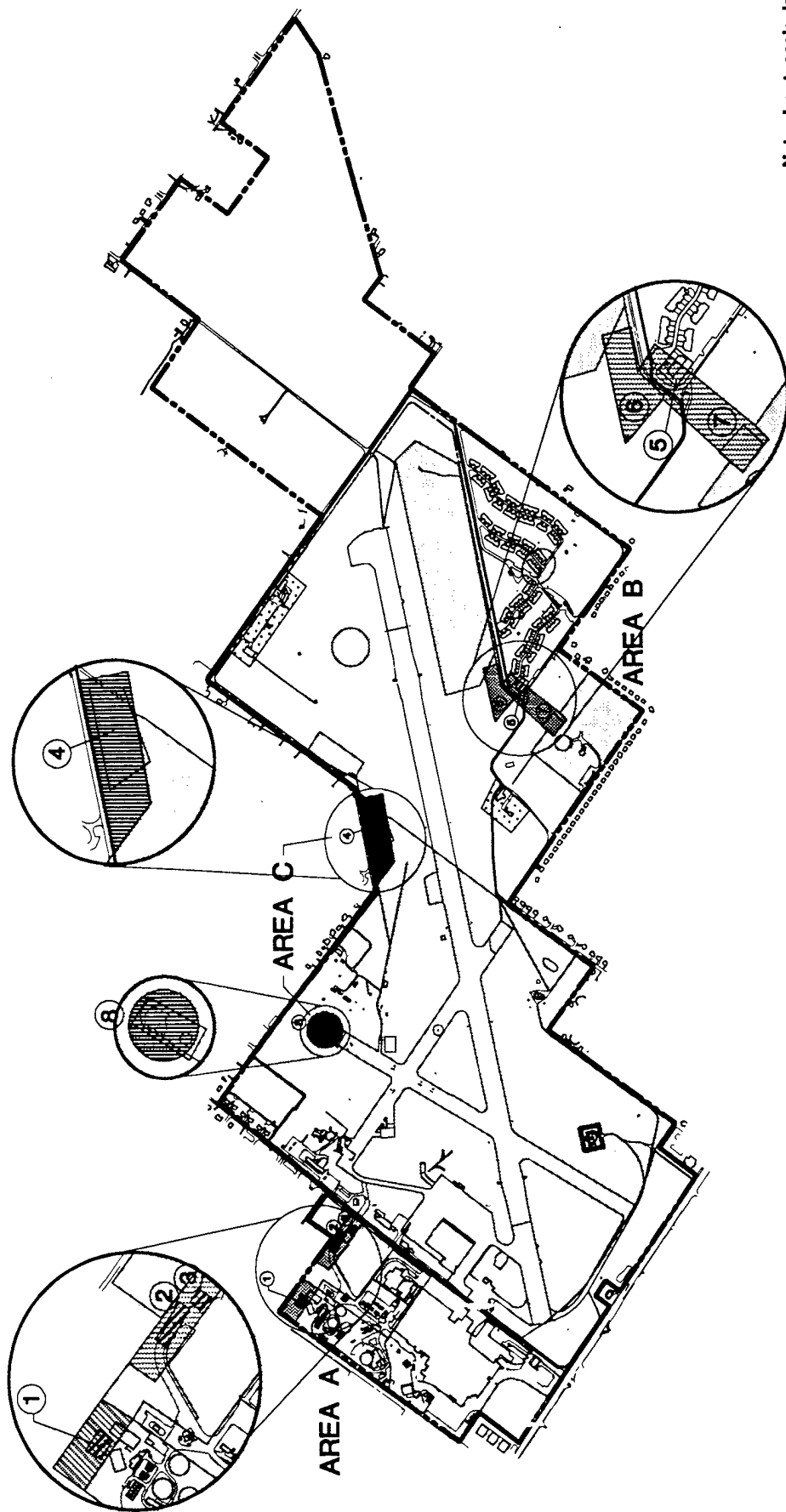
Installation Restoration Program

A Preliminary Assessment, the first step in the Navy's Assessment and Controls of Installation Pollutants Program (NACIPP), was conducted in 1980 to identify areas where waste containing hazardous substances may have been disposed at NAWCAD. (In 1987 the NACIPP became the Installation Restoration Program [IRP].) The areas of concern identified to date at NAWCAD are the eight inactive waste sites listed in Table 3.10-1 and shown on Figure 3.10-1 (Hazardous Waste Areas).

NAWCAD was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List on October 4, 1989. In accordance with applicable federal and Pennsylvania state laws, the Navy has completed two phases of Remedial Investigation (RI) work to date. The Phase I RI included sampling of soil and groundwater at IRP Sites 1 through 8 (SMC, September 1990). The Phase II RI included additional groundwater investigations at all IRP Sites (Haliburton NUS, April 1993). This investigation found that a CERCLA response action was necessary to address contaminated groundwater in overburden and shallow bedrock attributable to IRP Sites 1, 2, and 3 (Area A) and IRP Sites 5, 6, and 7 (Area B), collectively referred to as Operable Unit 1 (OU-1). A Feasibility Study (FS) was prepared in April 1993 and a Record of Decision (ROD) was signed with the US Environmental Protection Agency (USEPA) in September 1993. The ROD selected an interim remedy that includes pumping and treatment of water to minimize the migration of contaminated groundwater while further RI work is conducted to fully determine the nature and extent of groundwater contamination in Areas A and B.

In April 1993, the Navy initiated sampling of residential, municipal, and commercial wells in the vicinity of NAWCAD, at USEPA's request, to determine if any groundwater used by off-base properties may have been contaminated by past Navy waste disposal activities. The sampling results suggest that Area B and IRP Sites 4 and 8 (Area C) are potential contaminant sources along with an off-base source. In 1993 and 1994 nearby residences were connected to public water systems to ensure that local residents are not exposed to contaminated groundwater. The connection of residences to public water systems was identified as OU-2.

Hazardous Waste Areas



Note: Inset scale is 1" = 800'.



Building and Number
Property Boundary

- IR Program Site Number
- Category 1: Areas where no storage, release, or disposal has occurred
- Category 2: Areas where only storage has occurred
- Category 3: Areas where storage, release, disposal, and/or migration has occurred and action is underway but not final
- Category 4: Areas where storage, release, disposal, and/or migration has occurred but required response actions have not been implemented
- Category 5: Unevaluated areas or areas requiring additional evaluation

Figure 3.10-1

Source: BRAC Cleanup Team and EA Engineering, 1995

Table 3.10-1

Installation Restoration Program Site Summary Table

Site No.	Description	Type of Hazardous Materials	Date of Operation	Status
1	Burning Pit	Paints, oils, asphalt, roofing material, unspecified chemicals, firing range wastes	1940-1955	ROD for interim remedial action approved ^(a)
2	Disposal Trench	Industrial wastewater sludges	1965-1970	ROD for interim remedial action approved ^(a)
3	Burning Pit	Solvents, paints, roofing materials, and unspecified chemicals	1955-1965	ROD for interim remedial action ^(a)
4	Disposal Trench	Non-industrial solid wastes, paints, waste oils, waste metals, construction debris, solvents, and sewage treatment sludge	1966-1970	RI report completed ^(a)
5	Disposal Trench	Paints, solvents, scrap metal, and 30 drums of asphalt	1955-1970	ROD for interim remedial action approved ^(a)
6	Disposal Trench	Paints, solvents, demolition wastes, waste oils, other flammable wastes, and grease trap wastes	1960-1980	ROD for interim remedial action approved ^(a)
7	Disposal Trench	Industrial wastewater sludge	1950-1955	ROD for interim remedial action approved ^(a)
8	Firefighting Training Area	Aviation fuel, lubricants, coolants	1961-1988	RI Report completed ^(a)

Notes:

(a) Work Plan Addenda are prepared to address the data gaps identified during the RI.

RI = Remedial Investigation; ROD = Record of Decision; TBD = To be determined.

All sites are regulated under CERCLA.

Source: BRAC Cleanup Team and EA Engineering. March 1995.

Contaminated shallow groundwater attributable to Area C has been identified as OU-3. A ROD for OU-3, which uses a presumptive remedy of pumping and treating contaminated groundwater, is under final USEPA review.

A Phase III RI work plan addressing data gaps (Haliburton NUS, January 1995) is currently being reviewed. It includes additional RI work (including groundwater sampling) at Sites 1 through 8, as well as a newly identified area, Area 9. This area was allegedly used for the disposal of cut-up fuel tanks and incinerated rubber linings. The Phase III RI work will be implemented as the Navy and USEPA agree on RI work plans for the work of concern. Proposed RI work plans currently under review by the USEPA address potential contaminant sources at Area C (Sites 4 and 8) and Area 9, and groundwater at Area 9.

Compliance Program Status

Compliance activities at NAWCAD are being conducted along with environmental restoration activities. Since NAWCAD is slated for realignment, compliance activities will be coordinated with final property transfer. Compliance activities address storage tanks, polychlorinated biphenyls (PCBs), asbestos, radon, lead, waste management, and water and air discharges. The status of compliance projects at NAWCAD is presented in Table 3.10-2

Storage Tanks

In 1988, Pennsylvania received authority from USEPA to regulate underground storage tanks (USTs). Effective August 1993, USTs and aboveground storage tanks (ASTs) were required to conform with 25 PA Code Chapter 245. The most recent NAWCAD Tank Management Plan (January 1996) outlines current tank usage, capacity, regulating authority, location, and recommendations.

There are currently 32 USTs broken down into the following five categories:

- 17 USTs used to store No. 2 heating oil;
- Six USTs used to store diesel oil;
- Three USTs used to store automobile fuel;
- Five USTs used to store jet fuel; and
- One UST used to store aviation gasoline (to be converted to No. 2 fuel oil storage).

Table 3.10-2

Closure-Related Compliance Projects

Project	Status	Regulatory Program
1. Underground Storage Tanks	Existing tanks are in compliance with Pennsylvania and federal law; federal regulated tanks are tested annually in December. Records from 1986 could not account for approximately 900 gal of fuel oil delivered to the UST at Bldg 16. Evidence of a release could not be found.	Pennsylvania Department of Environmental Protection Regulations; (25 PA Code 245) Act 32; 1989)
2. Asbestos Testing/Removal	Asbestos survey completed in 1993. Removal of Friable, Accessible, and Damaged (FAD) asbestos schedule completed. An Operations and Maintenance Plan will be developed.	US policy for base closure and EPA, 29 CFR Subpart M Sections 61.140-61.1454
3. PCB Storage/Removal	Visual evidence of PCBs leak from the transformer at the PCBs Bldg 35 substation. Cleanup is scheduled to commence; six capacitors and one transformer were removed in 1993. Hydraulic equipment at NAWCAD was not found to contain PCBs. Two PCB-contaminated transformers have been retrofitted.	Toxic Substance Control Act, USEPA Policy
4. Bldg 130 and Bldg 15, 90-day Accumulation Area	Bldg 130 in operation since March 1992. Bldg 15 in operation since January 1993.	RCRA, 40 CFR 262.34, PA Code Title 25 Chapter 262 Subchapter A-D
5. Bldg Decontamination	Bldg 15 is a 90-day Accumulation Area since 1993. Bldg 15 closure completed 5 February 1993.	RCRA, OPNAVINST 5090.1A 9-6.5, PA Code Title 25 265.110-265.115, 40 CFR 265.110-265.115

Project	Status	Regulatory Program
6. Radon	Radon Inventory has been completed.	Navy Policy (CN) Hr 11000 Ser N444B/ 5U596033 of 12 Jan 1995 and DOD policies on asbestos, lead paint, and radon at BRAC properties of 31 Oct 1994)
7. Lead	A lead assessment was prepared by the NAWCAD Environmental Programs Office. Three sites are currently considered to be areas of concern for lead.	Navy Policy (CNO Hr 11000 Ser N444B/ 5U596033 of 12 Jan 1995 and DOD policies on asbestos, lead paint, and radon at BRAC properties of 31 Oct 1994)
8. Oil/Water Separators	None on site.	None
9. Solid Waste Management Units	None on site	RCRA
10. NPDES (Discharge to surface water)	Expired on 27 September 1994. WWTP operation under an administrative extension.	Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management, Title 25 Chapter 92; November 1990
11. Air Permits	Currently, NAWCAD has three air permits for classified materials incinerator, Boiler No. 1, and Boiler No. 3. Two of these permits expire on 31 March 1999, and the permit for Boiler No. 3 expired on 31 March 1994. NAWCAD has submitted a renewal application for this permit. Additionally, a Synthetic Minor Air Permit application under the Clean Air Act has been filed (Kurdziel, June 26, 1996).	Pennsylvania Department of Environmental Protection, Air Quality Program PA Code Title 25; March 11, 1995
Source: BRAC Cleanup Team and EA Engineering, March 1995.		

Fifteen of the USTs present at NAWCAD are regulated (state and/or federal). The remaining USTs are used for No. 2 heating oil, and are therefore exempt from state and federal regulation. Federally regulated tanks are precision-tested annually. No leaks have been detected in any of the USTs. As part of the Compliance Program, the UST at Bldg 16 was replaced following the loss of approximately 975 gallons of No. 2 fuel oil. A soil and ground investigation failed to identify any residual contamination.

Two spills occurred at the main boiler plant (Bldg 1) during oil transfer operations to Tanks 5, 6, and 7 on December 28, 1988 and December 31, 1989. During these two spills, oil entered storm drains and flowed to a small unnamed tributary of Little Neshaminy Creek. Spill responses included spill control and cleanup according to Pennsylvania Department of Environmental Protection regulations.

Nine USTs are scheduled for removal in two phases. Phase 1 will remove five USTs at the fuel farm and one UST at the Steam Plant (No. 2 fuel oil, Bldg 21) in the Summer of 1996 (US Navy, January 1996). Three USTs at the auto service station will be removed under Phase 2 between September 1996 and March 1997 and six USTs containing diesel will be emptied/replaced/upgraded or transferred to a new owner by December 22, 1998 (US Navy, January 1996).

A total of 17 ASTs have been identified on-site. Eleven ASTs store No. 2 fuel oil, one stores diesel, four store jet fuel (JP-4), and one stores kerosene. Four No.2 fuel oil, the jet fuel, and the kerosene ASTs are scheduled to be removed by September 1996 (Kurdziel, August 12, 1996).

Polychlorinated Biphenyls (PCBs)

Since 1984, the NAWCAD's PCB compliance program has included:

- Testing transformers for PCBs;
- Retrofitting or removing PCB transformers;
- Removing PCB capacitors; and
- Disposing of PCB-contaminated waste through DRMO contractors in compliance with the TSCA.

Currently, all components at NAWCAD that contained greater than 50 parts per million (ppm) of PCBs have been either retrofitted or removed. The last two PCB transformers (enlisted housing development and Substation 4A-1) were retrofitted in October 1994.

Hydraulic equipment was tested in June 1994 for PCB content. Concentrations of PCBs in all hydraulic fluids tested were below the detection limit of 5 ppm.

Asbestos

Asbestos-containing material (ACM) is regulated by USEPA and the Pennsylvania Department of Environmental Protection. For several years, NAWCAD's Public Works Department has funded a small crew of Philadelphia Naval Shipyard asbestos workers to work at NAWCAD removing asbestos. A field survey and report of ACM on base was prepared (Kimball, 1994). All friable, accessible, and damaged asbestos has been removed. An Operations and Maintenance Plan has been developed for remaining ACM. If additional friable, accessible and damaged asbestos is discovered prior to the NAWCAD move, it will be removed (BRAC Cleanup Team, 1995) or encapsulated (Kurdziel, June 26, 1996).

Radon

A total of 1,709 alpha-track radon detectors were installed in NAWCAD work areas. Radon levels in excess of the USEPA recommended action guideline of 4.1 picoCuries per liter of air (Pci/l) were reported from 15 detectors. Buildings with at least one detector indicating elevated levels of radon were Nos. 2, 3, 4, 80, and 108. The existing 207 family housing units at NAWCAD were also tested. Two housing units displayed radon concentrations at or in excess of the USEPA recommended action guideline.

Lead

A lead-based paint (LBP) survey was prepared by the NAWCAD Environmental Programs Office from November 11 to December 3, 1993. Over 200 x-ray fluorescent analysis (XRF) tests were conducted throughout Building Nos. 1, 2, 3, 4, 7, and 16 and compared to the HUD guidance levels for lead concentrations (1.0 mg/cm²). The survey determined that some LBP was present in the buildings at NAWCAD, but insufficient data were available to define the true extent. A more detailed study was recommended, but LBP is not considered to be a hazard unless chipping, peeling, or dusting.

Since April 1988, drinking water from water coolers has been tested for lead. All coolers that reported lead concentrations above the revised Maximum Contaminant Level (MCL) of 0.015 mg/L at the tap were replaced.

Records indicate that there were formerly two aircraft gun ranges and one outdoor small arms firing range in the vicinity of the main runway. The mounds for the small arms range and one of the aircraft ranges have been demolished. A trench exists at the site of the other aircraft range, allegedly formed by the action of projectiles penetrating the ground. These three sites, due to the nature of their past use, are suspected of containing potentially high levels of lead. They will be evaluated further as Phase II EBS review items.

Other Potential Sources Of Contamination/Migration Potential

A search of properties listed on federal and state information systems within a two-mile radius of NAWCAD was performed. Five sites were found on the CERCLA Information System (CERCLIS), two of which have been placed on the National Priorities List (NPL). The two NPL sites, identified as Fisher & Porter and Raymark, and the three other CERCLIS sites are unlikely to have an impact on NAWCAD (EA Engineering, March 1995).

Summary

Section 120(h) of CERCLA requires identification of parcels or locations, owned by the United States and being readied for the sale or transfer, on which hazardous substances were stored in quantities equal to or greater than the reportable quantity for one year or more, known to have been released, or disposed of on the property. Public Law 102-425 (Community Environmental Response Facilitation Act [CERFA]), requires the identification of all uncontaminated real property, or parcels thereof, at installations undergoing closure or realignment. As defined by CERFA, an uncontaminated property is any real property on which no hazardous substances or petroleum products or their derivatives (including aviation fuel and motor oil) were stored for more than one year or more, and there are no known releases or disposals associated with the property. The Environmental Baseline Survey (EBS) completed for NAWCAD defined seven categories as follows:

- Category 1 - Areas where no storage, release, or disposal (including migration) has occurred;
- Category 2 - Areas where only storage has occurred;
- Category 3 - Areas of contamination below action levels;
- Category 4 - Areas where all remedial action has been taken;
- Category 5 - Areas of known contamination with removal and/or remedial action underway;
- Category 6 - Areas of known contamination where required response actions have not yet been implemented; and
- Category 7 - Areas that are unevaluated or that require further evaluation.

The EBS report indicates that all NAWCAD property falls into one of five categories (Categories 1, 2, 5, 6, 7). Efforts are underway to take the actions necessary to ensure that all NAWCAD property falls into Categories 1 through 4.

4 IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter presents a discussion of the potential environmental impacts of the proposed action and its alternatives, including the no action alternative, on the affected environments described in Chapter 3. Chapter 4 is organized in a manner similar to Chapter 3. Subchapters 4.1 through 4.10 address environmental impacts at NAWCAD and the surrounding area of Bucks County as related to the implementation of four alternatives: no action, Reuse Plan, Residential, and Aviation. Subchapter 4.11 discusses cumulative impacts of the disposal and reuse of NAWCAD and other pertinent projects.

As a long range planning tool for the redevelopment of NAWCAD, the proposed Reuse Plan presents overall development goals and objectives, particularly with respect to general types of development (e.g., industrial versus residential) and the acreage and/or floor area allocated to each broad category of land use. However, the specific development remains uncertain and much will depend upon emerging opportunities and market parameters. This situation has necessitated two levels of project impact analysis: quantitative and qualitative.

Quantitative analyses were conducted wherever possible for those aspects of the proposed Reuse Plan that are essentially a function of the number of employees and/or square feet of development. For example, regional employment impacts, intersection analyses of future traffic, motor vehicle-related air and noise impacts, and sanitary wastewater loads are discussed quantitatively.

Qualitative analyses were conducted for those proposed Reuse Plan components that cannot be specified at this time. For example, specific building renovation and site layout plans have not yet been developed and specific related impacts can only be discussed qualitatively. Similarly, although sanitary wastewater loads can be quantified at this time, industrial wastewater loads and air emissions cannot, since the specific type and requirements of such future uses are unknown. However, the qualitative analyses presented do identify sensitive environmental issues that need to be addressed and describe the types of permits (and their requirements) that must be obtained.

4.1 Land Use

4.1.1 No Action Alternative

Under future baseline (no action) conditions, only the operation of the Navy family housing complex with 199 family units for enlisted personnel and six family units for officers would continue at NAWCAD. The remaining portions of NAWCAD would be vacated and closed in accordance with *Base Realignment and Closure Facility Layaway and Caretaker Maintenance Standards* (Naval

Facilities Engineering Command, September 1994). This action would not be consistent with existing land uses in central Bucks County and continued abandonment could have a blighting influence on the surrounding area.

4.1.2 Reuse Plan

Implementation of the Reuse Plan for NAWCAD would result in the continued use and further development of the site as a technologically advanced research and development center, with further expansion into the areas of higher education, more general industrial, business, and office uses, a hotel and conference center, housing (both single-family and senior congregate-care), various municipal uses, and park and recreational uses. The existing airport that accounts for the bulk of the NAWCAD land area would be discontinued and the runway removed. Figure 2-1 in Chapter 2 shows the allocation of the proposed uses superimposed on a plan of the existing base that includes the runway and other existing structures.

The key land use elements of the Reuse Plan would be tied together by a proposed new internal road system and series of "gateway" design elements to provide a distinctive sense of place and cohesiveness for the redeveloped complex.

In general terms, the reuse of existing facilities would be consistent with existing land uses. However, development of the new facilities and activities would involve a significant change in use from the existing airport (and its ancillary facilities) to the various proposed uses. As described in Subchapter 2.3, the proposed uses have been carefully considered, screened, and adopted by the FLRA, delegated the responsibility by the Bucks County Commissioners. The proposed uses are generally consistent with the land use character of the area surrounding NAWCAD, a mix of residential, commercial, light industrial, recreational, and rural uses. Nonetheless, the proposed uses would more intensively utilize the site than the present Navy activities.

Zoning

Zoning and land use policy for NAWCAD has reflected its status as a military facility. The largest portion, in Warminster Township, had recently been rezoned from a Military Reservation (MR) to a Planned Industrial Park (PIP). However, this rezoning was rescinded by the new Warminster Board of Supervisors. New zoning is being worked on with the County Planning Commission, the Warminster Planning Board, and the FLRA (Bass, July 2, 1996).

The site proposed for the congregate care facility under the Reuse Plan lies within Northampton Township. It is presently designated an Institutional/Public (I-P) zoning district. While a congregate care facility would be a permitted use, it would require a conditional use permit from the Board of Supervisors of Northampton Township (Northampton Zoning Code, Article VIII). The proposed

parkland, also slated for the Northampton portion of NAWCAD, is a permitted use under existing zoning. The proposed fire house and municipal well would be located in an Agricultural-Residential (A-R) zoning district, uses permitted by special exception, with approval by the Zoning Hearing Board.

In Ivyland, the 34-acre (14-hectare) site designated for residential development is presently zoned R-1, permitting single family homes on lots of 10,000 sq ft (929 sq m). Given that existing buildings already exist on the site, the actual acreage available is in the order of 30 acres (12 hectares). Given the requirements for roadways and other common spaces, the site may only accommodate approximately 100 units under the present zoning. If the 150-200 units, as proposed under the Reuse Plan, were to proceed to development, Ivyland Borough would need to rezone the site to accommodate this greater density. West of Jacksonville Road, that portion of the multi-business park (approximately two-acres [one-hectare]) in Ivyland is presently zoned I-C-2, permitting industrial and commercial uses. No specific use is proposed for this parcel in the Reuse Plan, although it is conceivable that it may serve as an extension of the existing parking for the multi-business complex.

4.1.3 Residential Alternative

The Residential Alternative would involve a level of development less intensive than the proposed Reuse Plan. This alternative shares many basic elements from the proposed Reuse Plan, including the proposed reuse of the main buildings as a multi-business complex, the congregate care facility, the proposed residential development in Ivyland, and much of the recreational development proposed in the Reuse Plan. It differs from that plan in that the university/institutional, municipal use and hotel/conference center components are eliminated, and the proposed industrial/business park is scaled back. Instead, a 400-unit residential golf community is proposed for a 250-acre (100-hectare) parcel.

The residential reuse of much of NAWCAD, as proposed under this alternative, would conform with the surrounding residential land use in Warminster and Northampton townships. The golf recreational component would provide an added market incentive and, given NAWCAD's location at the developing edge of the Philadelphia metropolitan region, would appear to have little problem in its potential marketability. The Reuse Plan "Option 2" analysis presumed average home prices of \$225,000.

4.1.4 Aviation Alternative

The Aviation Alternative would involve a level of development slightly more intensive than the proposed Reuse Plan. This alternative shares many basic elements from the proposed Reuse Plan, including the proposed reuse of the main buildings as a multi-business complex, the hotel/conference center, and much of the recreational development proposed in the Reuse Plan. It differs from that plan in that the university/institutional uses, congregate care and residential development are eliminated, and the proposed industrial/business park is mostly shifted north of the runway (see Figure 2-3).

The aviation reuse of part of NAWCAD, as proposed under this alternative, would be a basic general aviation facility for small aircraft. It would have a reduced length runway and ancillary airport operations would be limited to the area south of the runway. The breakdown of approximate acreages for the different components of the aviation facility is as follows:

- Runway - 84 acres (34 hectares);
- Terminal - 7 acres (3 hectares); and
- Hangars, maintenance, and tie-downs - 77 acres (31 hectares).

The aviation reuse of part of NAWCAD as proposed under this alternative would be in conformity with the historical use of the facility as an airport. It would, however, introduce a level of aviation operations substantially greater than has been seen at Warminster for many decades. Issues of compatibility with the surrounding residential land use in Warminster and Northampton townships as these areas have grown over recent decades, would undoubtedly be raised.

4.2 Socioeconomics

4.2.1 No Action Alternative

Demography

Under the no action alternative, the Navy would entirely vacate NAWCAD, with the exception of the six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex (to be transferred to NASJRBWG).

NAWCAD loading in 1990 totaled 3,605 personnel. Prior to the BRAC closure decision, NAWCAD base loading was expected to remain constant through 1996. However, since closure plans were announced, Navy functions at the base have been decreasing. As of the end of August 1995, permanent civilian personnel totaled 1,398 plus 132 military personnel. As of May 1996, civilian and military personnel total 1,107 and 22, respectively (Frederick, June 12, 1996). At the time of NAWCAD closure, there will be no Navy personnel at the base. Of the former employees remaining in the region, it can be assumed that the great majority would seek alternative employment, and at least temporarily join the region's pool of unemployed workers. Others would be expected to retire or relocate from the region. A survey of NAWCAD employees by Coopers & Lybrand indicated 9.5 percent of respondents would retire when NAWCAD closes (Bucks County EAC, May 1994). In the context of the population of Bucks County (541,224 in 1990) and the surrounding region, the numbers of those relocating out of the region are relatively small (less than one percent) and the no action alternative would not create significant adverse demographic impacts.

Employment and Income

Under the no action alternative, there would be no redevelopment at the base and hence no new income would be generated by businesses, institutions, and their employees.

There would be socioeconomic consequences of the Navy's withdrawal. Such consequences are likely to include a direct increase in unemployment in the region. If all the NAWCAD workers who do not relocate or retire are left unemployed, this would total approximately 665 workers. In the context of Bucks County's unemployment level of 4.9 percent (14,993 persons) in July 1995, the 665 person increment would increase the unemployment rate to 5.1 percent. There would also be direct and indirect declines in business activity, declines in demand for housing, and declines in local government revenues. While not creating these conditions, the no action alternative does nothing to alleviate them. Moreover, the virtual abandonment of the base could further detract from the quality of local conditions if vandalism or visual blight were to escalate, thereby lowering property values and/or inducing more households to leave the area.

Fiscal Impacts

Under the no action alternative, there would be no redevelopment at the base and hence no new tax revenues would be collected from real property taxes, earned income taxes, or other relevant business taxes and fees. The relevant local governments and the state would receive no revenues to off-set the loss of the former activity at NAWCAD. Existing public infrastructure, facilities, and services would therefore have to be maintained by a reduced economic base. On the other hand, the no action alternative implies that there would be no inducement of new residential growth in the county as a result of the redeveloped base and, hence, there would be no increment of costs associated with the provision of additional services to the new households.

Housing

Under the no action alternative there would be no redevelopment at the base and no new housing would be constructed there. There would be no new workers and, hence, no new demand created for housing in the region by the reuse of NAWCAD. The no action alternative assumes the reassignment of 132 military personnel and relocation of approximately 600 civilian workers (as of May 1996) to Naval Air Warfare Center Aircraft Division Patuxent River. Additional unknown numbers of previous NAWCAD workers may relocate from the region to seek employment or retire. The net effect will be a small but noticeable depression in the Philadelphia metropolitan region's housing market, particularly in the short-term following closure of the base in 1996. The six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex would continue to be occupied by the Navy.

4.2.2 Reuse Plan

Demography

The Reuse Plan proposes to introduce some 150 to 200 new homes in the Ivyland section of NAWCAD (ERA, 1995). Assuming that the average Bucks County household size of 2.8 persons in 1990 would apply to these units, the new population generated would range from approximately 400 to 600. Table 3-2.2 shows the age breakdown of the Bucks County population in 1990. If these assumptions were to be applied to the new population, then approximately one-third would be under age 18. Another residential component of the Reuse Plan is the congregate care facility proposed in Northampton. This facility is projected to be approximately 250,000 sq ft (23,225 sq m) and is likely therefore to accommodate an estimated 570 seniors.

Other significant demographic consequences would result from the development of jobs at the former base. As elaborated in Subchapter 2.3, the Reuse Plan proposes to develop 7,255 jobs at the

redeveloped NAWCAD between the years 1996 and 2010. The Navy's relinquishment of the BRAC 95 properties and the anticipated reuse of those facilities would provide an additional 340 jobs, for a total of 7,595 jobs.

The Reuse Plan anticipates phasing of this job development as noted in Table 4.2-1. The table omits, however, the jobs associated with the proposed university use, the hotel/conference center, and BRAC 95. Exact phasing for redevelopment projects of this kind is inherently uncertain, so the Reuse Plan's assumptions are only approximate. It is assumed here that these developments would occur in the later period.

Table 4.2-1

Reuse Plan Proposed Job Development at NAWCAD

Year	Jobs
1995-1996	200
Year 1-5	3,250
Year 6-10	1,760
Year 11-15	1,360
Source: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.	
Notes: For comparative purposes, NAWCAD loading was as high as 4,600 in 1990. It has been steadily declining since and, as of May 1996, totaled 1,129.	

Placed in the relative context of the Bucks County labor force, an increase of 7,600 jobs under the Reuse Plan would represent less than 2.5 percent of the 1995 resident labor force. If all prospective employees were drawn from the pool of Bucks County unemployed workers, it would reduce the numbers of those who were unemployed by 50 percent (see Table 3.4-1) or, alternatively, would increase in-migration of new workers. Projections of the labor force from 1990 to the year 2010, by Bucks County Planning Commission, indicate a growth of between 51,386 to 86,646 persons (low and high projections, respectively), and thus easily able to absorb the proposed jobs at NAWCAD. Employment in the county is projected to increase between 49,316 and 83,216 jobs over the 1990 level (Bucks County Continuum, 1994).

The population of Bucks County is projected to increase by 124,578 between 1990 and 2010 (Bucks County Continuum, 1994); and new housing is projected to increase by 51,066 to 83,216 units (low and high projections, respectively) over the same time frame. The projected increase in housing in the county reflects, for the most part, anticipated in-migration to the county as the suburbanization of the Philadelphia metropolitan region continues.

Within the context of Bucks County and its projected growth through year 2010, the proposed development at NAWCAD would be consistent with anticipated population and employment growth and unlikely to trigger any particular or unexpected problems. Moreover, the location of new workers at NAWCAD would not be limited to Bucks County. Although Bucks County would likely be the dominant place of residence for these workers, a substantial but unknown proportion is likely to live elsewhere, particularly in Montgomery County. Survey data, collected from current NAWCAD employees in November 1993 by Coopers & Lybrand (consultants to the Bucks County Economic Adjustment Committee), indicated that 62.5 percent resided in Bucks County, 24.9 percent in Montgomery County, and 12.6 percent elsewhere (Bucks County EAC, May 1994).

In light of the foregoing statistics and future projections, defining the specific demographic consequences of the proposed Reuse Plan may be seen as difficult to determine with precision, but it appears that the anticipated growth at NAWCAD would be well within that already projected to be accommodated by the county through year 2010.

Employment and Income

The characteristics of almost 7,600 new permanent jobs proposed by the Reuse Plan are broadly identified by industry category in the Reuse Plan (ERA, 1995) and are shown in Table 4.2-2. The mean earnings associated with these industry categories have been estimated in 1995 dollars based on current national data provided by the Bureau of Labor Statistics. The total projected annual earnings of this proposed employment, in 1995 dollars, would be almost \$199 million. If the university parcel is replaced by industrial uses (as mentioned in Subchapter 2.3.1), this could push employment on this parcel to 2,000, based on: 1) future Warminster zoning; 2) assuming a structure of 1.6 million sq ft (148,640 sq m); and 3) a space per employee ratio of 800 sq ft (74 sq m). Overall employment would then exceed 9,000 with earnings of \$243.4 million.

In addition to permanent jobs, there would be temporary jobs generated by the construction activity anticipated in the Reuse Plan and indirect employment generated as the earnings from the construction employment circulate in the regional economy. Total construction costs under the Reuse Plan are estimated at \$216 million (see Table 4.2-3). The Reuse Plan uses costs of \$25 per sq ft for industrial space and \$80 per sq ft for office space. These are probably very low estimates (by comparison, the Urban Land Institute uses \$125 per sq ft as the cost for office development in its *Development Impact Handbook 1994*, and the city of Philadelphia uses values of \$150 per sq ft for new office construction and \$100 per sq ft for new industrial construction in its proposed Reuse Plan for the Naval Base and Shipyard [Philadelphia Office of Defense Conversion, 1994]).

For the sake of consistency, the Reuse Plan for NAWCAD is the source of the construction cost data used here, with the exception of the university portion for which it provides no data. In this instance, a relatively modest estimate of \$50 million is made for the university. Clearly, if constructed at very

Table 4.2-2

Reuse Plan Proposed Employment & Estimated Earnings

Industry Category	Jobs	Estimated Mean Annual Wage (\$ 1995)	Estimated Total Annual Earnings (\$ 1995)
Multi-Business ("Incubator")/University	2,625	30,056	78,897,000
Industrial	2,850	27,100	77,234,430
Office	520	23,338	12,135,822
Hotel/Conference	260	12,501	3,250,208
Congregate Care	800	14,033	11,226,592
University use	515	30,056	15,478,840
(Industrial use) ¹	(2,000)	(27,100)	(60,112,000)
Parks and Recreational	25	23,504	587,600
Totals	7,595		198,810,452
<p>Source: Based on Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995; BRAC 95 assumptions add 225 jobs to the multi-business complex and 115 jobs to the University and are derived from interviews with FLRA staff; and US Dept. Of Labor, Bureau of Labor Statistics, Employment and Earnings, August 1995.</p> <p>Note: ¹ Assumes that university parcel is replaced by industrial uses as described in Subchapter 2.3.1</p>			

Table 4.2-3

Reuse Plan Estimated Construction Costs

Project	Est. Construction Costs (\$millions)
Industrial	35.6
Business (Office)	10.4
Hotel/Conference	10.5
Congregate Care	50.0
University(a)	50.0
Parks and Recreation	3.0
Residential	35.0
Site Improvements	21.2
Totals	215.7
Note (a): The estimated cost of the university campus is not provided in the Reuse Plan, the figure of \$50 million is adopted here to provide an order of magnitude estimate. Source: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.	

modest levels of amenity, a university facility could be less than this estimate. On the other hand, if more elaborate facilities (libraries, auditoria, laboratories, etc.) are included, costs could climb substantially. The alternative industrial assumption for the university parcel is estimated to generate a construction cost of \$40 million for that parcel assuming costs of \$40 per sq ft.

Based on these estimated construction costs, it is possible to project the number of direct construction jobs, and other indirect jobs, generated by this construction activity. An estimate of the direct employment created by the construction activity is needed first. The Urban Land Institute's (ULI) *Development Impact Assessment Handbook*, (ULI, 1994) provides a model based on national data that an estimated 2,168 direct construction jobs would be created based on this total value of construction.

The total economic impact of the construction expenditures can also be derived from an econometric input/output model known as RIMS II. The US Bureau of Economic Analysis model for the nine-county Philadelphia region was used for this EIS. On the basis of the employment and earnings multipliers provided by the model, it is possible to estimate the employment and income effects of

the temporary construction employment in the region. These are shown in Table 4.2-4. Construction employment is projected by the RIMS II model to provide a total of 5,458 person-year jobs, spread over the development period, this would average 364 jobs in each of the 15 years. In reality, there would likely be more jobs in the earlier years but with several peaks and troughs over the entire period. Applying the ULI assumptions of 2,168 direct construction jobs to the RIMS II data implies that 3,290 would be in other industries. Total earnings from the direct construction jobs is estimated at over \$70 million.

Table 4.2-4

Reuse Plan Construction and Other Indirect Employment
From Construction Activity

Activity	Employment	Earnings (\$ millions)
Construction	2,168	70
Other Industries	3,290	84
Totals	5,458	154
Source: Based on US Bureau of Economic Analysis, RIMS II model of Philadelphia Region, 1995; and ULI, Development Impact Assessment Handbook, 1994.		

The permanent employment proposed under the Reuse Plan would reach approximately 7,600 jobs. The spending by the households of these employed workers would also generate additional secondary economic activity. Estimates of these secondary jobs and earnings have similarly been derived from the RIMS II model for the Philadelphia region. In this instance, the categories of employment are allocated to their respective standard industrial classification codes (SICC) in the detailed 471 industry input/output (I/O) matrix, which is then used to obtain the industry-specific direct-effect multipliers (Table 4.2-5). The total employment and earnings generated by the proposed activity is computed and indirect effects are obtained by deducting the direct employment and earnings. Total direct and indirect employment is computed at 15,684 jobs, with indirect employment representing almost 52 percent of this at 8,089 jobs. Total earnings are projected to be over \$365 million, of which \$166.5 million are generated indirectly. It should be emphasized that these numbers are in 1995 dollars but the volume is based on the full build-out scenario in year 2011. As the proposed reuse development is phased in, the indirect jobs and earnings would grow proportionately.

Table 4.2-5

Reuse Plan Direct and Indirect Employment & Earnings at Full Build-Out

Industrial Classification	Industrial Code	Direct Jobs	Direct Earnings (\$ million)	Multipliers		Total Jobs	Indirect Jobs	Total Earnings (\$ million)	Indirect Earnings (\$ million)
				Jobs	Earnings (\$ million)				
"Incubator"/University	77.0402	2,625	78.897	1.6892	1.7996	4,434	1,809	141.983	63.086
Industrial	62.0100	2,850	77.234	2.5405	1.8358	7,240	4,390	141.786	64.552
Office	73.0105	520	12.136	2.6043	2.0564	1,354	834	24.956	12.820
Hotel/Conf.	72.0100	260	3.25	1.9608	2.0287	510	250	6.593	3.343
Congregate Care	77.0800	800	11.227	1.5476	1.8747	1,238	438	21.047	9.820
University	77.0402	515	15.479	1.6892	1.7991	870	355	27.848	12.369
Park and Recreation	76.0206	25	0.588	1.5077	1.8787	38	13	1.105	0.517
Totals		7,595	198.811			15,684	8,089	365.319	166.508

Source: Based on US Bureau of Economic Analysis, RIMS II model of Philadelphia Region, 1995.

Notes: Dollars in 1995\$

Numbers may not total exactly due to rounding

Fiscal Impacts

The proposed Reuse Plan suggests substantial fiscal benefits from the development of the base as described in Chapter 2. At full build out, the Reuse Plan shows an estimated 4.85 million sq ft (450,565 sq m) of new and reused business and institutional space plus 150 to 200 new residential units. Much of this development would be newly brought onto the tax rolls for property taxes or provide payments in lieu of taxes (PILOT), the employment would generate new earned-incomes taxes, and the business activity generally would raise new revenues from business taxes and fees. Estimates of some of these new revenues are made in the community Reuse Plan.

Table 2-4 (Chapter 2) shows the property taxes ascribed to some of the key elements of the proposed redevelopment in the Reuse Plan. Annual estimates are provided, totaling \$1,473,804 for the industrial/office park (\$810,097), the hotel (\$168,457), and the new residential development (\$495,250). These estimates provided by the Reuse Plan must be considered approximate because they assume relatively low values per sq ft for the industrial and office space. The applicable millage applied to the assessed value (AV), the percent allocations to local government, and the share of the projected revenues are shown in Table 4.2-6, using Warminster as the recipient jurisdiction. Ivyland and Northampton would receive a share from the property taxes for the residential and congregate care facilities, respectively.

Table 4.2-6
Projected Real Property Taxes

Recipient Government	Millage*	Percent Share	Dollar Share
Warminster	\$21.75	7.4	\$109,061
Centennial School District	\$218.00	74.3	\$1,095,036
Bucks County	\$53.50	18.2	\$268,232
Total	\$293.25	100	\$1,473,804
Note: * Millage is the rate applied per \$1,000 of assessed value Source: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.			

Other activities in the existing buildings and the proposed congregate care facility and university are designated as PILOT and would be subject to negotiation because of the potential for public and non-profit ownership status. Consequently, the amount of revenues that would be generated by these functions is unknown at this time.

Warminster would also benefit from an earned income tax of one percent applied to the earnings of the projected employees at the redeveloped base. Table 4.2-2 shows anticipated earnings at full

build-out of almost \$199 million (1995 dollars). Thus, Warminster could anticipate annual earned income taxes of close to \$2 million, a sum that would represent a 63 percent increase on the earned income tax revenue projected in Warminster's 1995 budget. Northampton would receive such income taxes from the projected employment at the congregate care facility that would be located on its portion of the base. Additional local revenues would flow from Business and Occupational Privilege Taxes, as well as from other minor taxes and fees. However, because they are relatively small and difficult to predict, no estimate of increases in these revenues is made at this time. Additional tax revenues would be generated on a temporary basis during the construction of the base.

Depending on where employees of the redeveloped base and their households reside, and to the extent they generate new residential construction, additional real property taxes would flow to local government. Assumptions used earlier in Section 4.2.3 assumed many of the new workers would be former employees of NAWCAD or occupy homes already built. The projected 3,000 new housing units for Central Bucks County associated with employees of the redeveloped NAWCAD are mostly assigned to the Northampton and Doylestown Planning Areas. Of the 1,009 assigned to the Northampton Area, 722 were in Northampton Township and 40 in Warminster Township (see discussion on Housing below).

New households would generate new service demands on local governments. Because of the long period of proposed build out of the Reuse Plan and the uncertainty of exactly where these new employees would reside, it is not appropriate to model and project what the fiscal implications of their presence implies for specific local governments. While in general, new homes and working households are likely to be net tax generators for local government, much will depend on their specific geographic distribution and condition of the relevant schools and other local services at the time. At the present time, Centennial School District may be able to absorb many new school children before having to construct new facilities because of recent declines in its school population, and Warminster Township may have relatively few new service burdens associated with the redevelopment of the base. And yet, it was noted already that Warminster Township would be a principal beneficiary of the earned income tax and that the Centennial School District the principal beneficiary of the increases in real property taxes at the base. A more equitable sharing of costs and burdens associated with the base and any new residents may be an issue for the relevant local governments to consider but it is too speculative to identify these issues more certainly at this time.

Housing

No detailed plans for these proposed housing facilities on the former base are provided. However, for the congregate care facility, an approximate project total sq ft of 250,000 sq ft (23,225 sq m) was indicated by FLRA staff. Applying an assumption of 440 gross sq ft (41 gross sq m) per bed implies the facility would accommodate 568 residents. The Reuse Plan proposed new units in Ivyland are given in the range of 150 to 200; however, the acreage available and the applicable zoning may reduce these proposed totals to something on the order of 100 units (see discussion under Zoning

impacts of Reuse Plan above). As a conservative assumption for measuring impacts the estimate of 175 units in Ivyland is adopted here.

The demand for housing generated by the approximately 7,600 new workers at NAWCAD should be placed in the prior context where base personnel loading was as high as 4,600 in 1990. Of these, 3,440 were civilian Navy employees and 800 were contract employees. Employment has been steadily declining at the base in recent years with a consequent weakening of the local economy, including the demand for housing as employees leave the region to retire or seek alternative employment. New employees at the redeveloped base would, potentially, include those idled by the departure of the Navy and therefore already in residence in the region, as well as those potential immigrants who would be able to occupy residences vacated by those former employees who have relocated elsewhere. Nevertheless, there would be an increased demand for new housing created by the redeveloped NAWCAD.

Taking into account the previous levels of base loading, the aggregate increase in demand is estimated, in order of magnitude terms, at approximately 3,000 new units. Naturally, the demand for these new housing units is likely to extend geographically beyond Bucks County, at least into the surrounding counties of the region.

The Bucks County Planning Commission projects an increase in housing units in the county of between 27,366 (low) to 35,466 (high) units over the period 1990 to 2000. The projections through year 2020 are shown in Table 4.2-7. Even if all the expected increment of approximately 3,000 new housing units accommodating the new workers at NAWCAD were to be located in Bucks County, the anticipated growth of housing in Bucks County could easily absorb this anticipated demand.

Table 4.2.7

Bucks County Housing Unit Projections

	1980	1990	2000	2010	2020
Census	165,438	199,934	—	—	—
Low	—	—	227,300	251,000	262,100
Middle	—	—	232,900	260,600	283,900
High	—	—	235,400	269,300	296,300
Source: Buck County Planning Commission, Bucks County Continuum, January, 1994.					

It is difficult to identify exactly where the new housing accommodating the redeveloped NAWCAD workers will be located. The survey of existing NAWCAD employees by Coopers & Lybrand (EAC, 1994) reported 62.5 percent lived in Bucks County. With lower Bucks County already largely built up, new housing development would most likely be concentrated in the central Buck County region,

particularly in areas where sewer and water services are being extended. The Buck County Planning Commission has made projections of where it anticipates housing growth, by planning area and by municipality (Bucks County Planning Commission, 1994). Table 4.2-8 shows the projections by planning area and for the municipalities within the Northampton planning area, as well as the allocation of the decennial increments.

While it is impossible to predict accurately in which municipality specific numbers of new NAWCAD workers will reside, the Planning Commission's projected growth of the housing supply may serve as a reasonable surrogate for predicting the relative distribution of this new housing demand. On this basis, Northampton Planning Area is anticipated to account for 33.6 percent of the housing increment during the years 2000 to 2010 (Table 4.2-8), and Warminster Township would account for 1.3 percent of the projected increment.

Using this model and making the conservative assumptions that *all* of the 3,000 anticipated new housing units for the workers at the redeveloped NAWCAD were to be located in central Bucks County and *all* of this in the single decade of 2000 to 2010, would imply that 1,008 of these units would locate in the Northampton Planning Area and, of these, an estimated 722 would locate in Northampton Township and 40 in Warminster Township. Warwick Township and Upper Southampton would account for about 170 and 74 housing units, respectively. Table 4.2-9 shows this geographic assignment of the anticipated 3,000 new housing units. For each planning area, the assignment of the new units attributable to NAWCAD accounts for about 22 percent of the County Planning Commission's projected growth for the decade 2000 to 2010.

4.2.3 Residential Alternative

Demography

Not only would the Residential Alternative introduce more residents to the site than would the Reuse Plan, it would also reduce the number of anticipated jobs. Using the 1990 average household size for Bucks County of 2.8, the golf/residential complex of 400 units would introduce some 1,120 persons. Similarly, the area devoted to residential in the Ivyland parcel is proposed for 150 to 200 units and implies, therefore, some 420 to 560 new residents; this element is already included in the Reuse Plan. Together, these two residential components would represent some 550 to 600 new households, composed of some 1,540 to 1,680 persons. The congregate care facility in the Northampton portion of the base would be unchanged from the Reuse Plan, with an estimated population of approximately 570 residents.

Table 4.2-8

Distribution of Projected Housing Supply in Central Bucks County
(Middle Range Projections)

Planning Area	1990		2000		2010		2020		Increments					
	Units	%	Units	%	Units	%	Units	%	1990-2000		2000-2010		2010-2020	
									Units	%	Units	%	Units	%
Doylestown	18,671	27.5	23,760	27.7	28,710	28.9	32,960	30.4	5,089	28.2	4,950	37.0	4,250	46.6
Buckingham	5,578	8.2	6,650	7.7	7,620	7.7	9,190	8.5	1,072	5.9	970	7.2	1,570	17.2
Solebury	3,510	5.2	4,290	5.0	4,910	4.9	5,340	4.9	780	4.3	620	4.6	430	4.7
Northampton	30,748	45.4	37,750	43.9	42,250	42.6	44,570	41.1	6,966	38.6	4,500	33.6	2,320	25.4
Newtown	9,320	13.7	13,460	15.7	15,800	15.9	16,350	15.1	4,140	22.9	2,340	17.5	550	6.0
Total	67,863	100	83,850	100	99,290	100	108,410	100	18,047	100	13,380	100	9,120	100
Within Northampton Planning Area														
Ivyland	192	0.3	200	0.2	210	0.2	220	0.2	8	0.1	10	0.1	10	0.1
Northampton	11,486	16.9	16,080	18.7	19,300	19.4	20,730	19.1	4,594	25.5	3,220	24.1	1,430	15.7
Upper Southampton	5,918	8.7	6,580	7.7	6,910	7.0	7,020	6.5	662	3.7	330	2.5	110	1.2
Warminster	11,207	16.5	11,880	13.8	12,060	12.1	12,180	11.2	673	5.7	180	1.3	120	1.3
Warwick	1,981	2.9	3,010	3.5	3,770	3.8	4,420	4.1	1,029	38.6	760	5.7	650	7.1
Source: Bucks County Planning Commission, Bucks County Continuum, 1994. Note: Numbers may not total exactly due to rounding														

Table 4.2-9

Reuse Plan Assignment of Induced Housing Demand to Central Bucks County
(Middle Range Projections 2000-2010)

Planning Area	Projected Growth 2000-2010		Assignment of 3,000 Housing Units
	Housing Units	%	
Doylestown	4,950	37.0	1,110
Buckingham	970	7.2	217
Solebury	620	4.6	139
Northampton	4,500	33.6	1,008
Newtown	2,340	17.5	525
Total	13,380	100	3,000
Within Northampton Planning Area			
Ivyland	10	0.1	2
Northampton	3,220	24.1	722
Upper Southampton	330	2.5	74
Warminster	180	1.3	40
Warwick	760	5.7	170
Source: Housing projections from Bucks County Planning Commission, Bucks County Continuum, 1994.			

Employment and Income

The employment and earnings estimated for the Residential Alternative are shown in Table 4.2-10. Direct employment at full build out is seen to be 5,042 with associated earnings of over \$101 million. In addition to the permanent jobs, there would be temporary jobs generated by the construction activity anticipated in the Residential Alternative and indirect employment generated as the earnings from the construction employment circulate in the regional economy.

Capital expenditures for infrastructure elements (new roads, utilities, etc.) are likely to be relatively similar to the Reuse Plan's estimate of \$21.2 million. Other construction costs are identified in Table 4.2-11. It will be seen that total construction costs are estimated at \$218 million. Based on these estimated construction costs, it is possible to project the number of direct construction jobs and other indirect jobs generated by this construction activity. Following the same method identified in the section on employment for the Reuse Plan, the model estimates that 2,191 construction jobs would be created. An additional 3,325 jobs would be created in other industries, thus generating a total of 5,516 direct and indirect jobs from the construction.

As noted in the employment section for the Reuse Plan, another approach to the total economic impact of the construction expenditures can be derived from the econometric input/output model known as RIMS II. On the basis of the employment and earnings multipliers provided by the model, it is possible to estimate the employment and income effects of the temporary construction employment in the region. For the Reuse Plan, these are shown in Table 4.2-4. Construction employment is projected by the RIMS II model to provide a total of 5,516 person-year jobs. Spread over the development period, this would average 367 jobs in each of the 15 years. In reality, there would likely be more jobs in the earlier years but with several peaks and troughs over the entire period. Total earnings associated with construction employment are estimated to be \$70.7 million for direct and \$85.8 million for indirect employment.

The permanent employment proposed under the Residential Alternative was noted above to total 5,042 jobs. The spending by the households of these employed workers will also generate additional secondary economic activity. Estimates of these secondary jobs and earnings have similarly been derived from the RIMS II model for the Philadelphia region. Again, the categories of employment are allocated to their respective standard industrial classification codes (SICC) in the detailed 471 industry input/output (I/O) matrix that is then used to obtain the industry-specific direct-effect multipliers. The total employment and earnings generated by the proposed activity are computed and indirect effects are obtained by deducting the direct employment and earnings. Total direct and indirect employment is computed at 9,567 jobs, with indirect employment representing 47 percent of this at 4,525 jobs. Total earnings are projected to be almost \$242 million, of which almost \$110 million are generated indirectly. It should be emphasized that these numbers are in 1995 dollars but

Table 4.2-10

Residential Alternative Anticipated Employment & Estimated Earnings

Industry Category	Jobs	Estimated Mean Annual Wage (\$ 1995)	Estimated Total Annual Earnings (\$ 1995)
"Incubator" (Multi-Business)	2,625	30,056	78,897,000
Industrial	1,165	27,100	31,571,500
Business	212	23,338	4,947,656
University/Institutional	115	30,056	3,456,440
Congregate Care	800	14,033	11,226,592
Golf/Residential	100	23,504	2,350,400
Parks and Recreation	25	23,504	587,600
Totals	5,042		101,465,688
Source: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995 (BRAC 95 assumptions add 225 jobs to the multi-business complex and 115 jobs to the university and are derived from interviews with Reuse Authority staff); and US Dept. Of Labor, Bureau of Labor Statistics, Employment and Earnings, August 1995.			

Table 4.2-11

Residential Alternative Estimated Construction Costs

Project	Est. Construction Costs (\$millions)
Industrial	14.6
Business	4.2
Congregate Care	50.0
Golf/Residential	90.0
Parks and Recreation	3.0
Residential	35.0
Site Improvements	21.2
Totals	218.0
Based on: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.	

the volume is based on the full build out scenario in year 2010. As the proposed reuse development is phased in, the indirect jobs and earnings would grow proportionately.

Fiscal Impacts

As with the Reuse Plan, the Residential Alternative suggests substantial fiscal benefits from the redevelopment of the base. Under the Residential Alternative, the estimated number of jobs generated would be 5,042, one-third fewer than under the Reuse Plan. Earnings are estimated at \$101.5 million, 51 percent of the level under the Reuse Plan. The Residential Alternative would increase the number of on-site new housing units from 175 under the Reuse Plan to 575.

Using the assumptions shown in the section above on the fiscal impacts of the Reuse Plan, and prorating them to the program proposed under the Residential Alternative, projections of real property taxes are shown in Table 4.2-12. Real property tax collections of \$2.2 million plus PILOT payments are expected. Following the assumptions made in Table 4.2-6 above, these would be distributed to the relevant jurisdictions on the basis of 7.4 percent to the township, 74.3 percent to the school district, and 18.2 percent to the county. The PILOT payments will be subject to negotiation and the amount of revenues that would be generated by these functions is unknown at this time.

Warminster would also benefit from an earned income tax of one percent applied to the earnings of the projected employees at the redeveloped base. Table 4.2-10 shows anticipated earnings under the Residential Alternative at full build-out of over \$101 million (1995 dollars). Thus, Warminster could anticipate annual earned income taxes of over \$1 million, a sum that would represent a 32 percent increase on the earned income tax revenue projected in Warminster's 1995 budget. Northampton would receive such income taxes from the projected employment at the congregate care facility that would be located on its portion of the base. Additional local revenues would flow from Business and Occupational Privilege Taxes, as well as from other minor taxes and fees; such taxes currently represent about 14 percent of Warminster's 1995 Budget. No estimate of increases in these revenues is made at this time. Additional tax revenues would be generated on a temporary basis during the construction of the base.

Employees of the redeveloped base under the Residential Alternative are projected to number 5,042 at full build out. Depending on where these employees and their households reside, and to the extent they generate new residential construction, additional real property taxes would flow to local government. An estimate of 1,800 new housing units induced by the redevelopment was used in sections above and applied in the analysis of demographic, housing, and community service impacts. Similar distribution assumptions would apply to share of real property taxes collected from these new units, but because of the uncertainty of exactly where such new residents would actually live, no estimate is made of what the specific fiscal implications would be. For Ivyland and Northampton, the Residential Alternative would have essentially the same fiscal consequences as the Reuse Plan because

Table 4.2-12

Residential Alternative Revenues and Property Taxes (Years 1-15)

Use	Demand Forecast	Land Sales (totals)	Rent (per year)	Property Taxes (per year)
Multi-Business Complex	1.3 million sq ft (128,000 sq m)		\$3,200,000	PILOT
Industrial/Business	65 acres (26 hectares)	\$3,863,160		\$331,168
Golf/Residential	250 acres (101 hectares)	\$22,000,000***		\$1,413,750
Residential (single family)	34 acres (14 hectares)	\$5,000,000***		\$495,250
Parks and Recreation	210 acres (85 hectares)			\$0
Congregate Housing	38 acres (15 hectares)			PILOT
University (Bldgs 125 & 138)	61,000 sq ft (5,700 sq m)		\$183,000*	PILOT
Inertial Lab	25,000 sq ft (2,300 sq m)		\$74,500*	PILOT
Dynamic Flight Simulator	72,000 sq ft (6,700 sq m)		\$216,000*	PILOT
Grand Total		\$10,450,000	\$3,673,000	\$2,240,168 plus PILOT

Notes: PILOT = Payment in lieu of taxes, to be negotiated;

Land use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions;

* Based on assumption of \$3 per sq ft used for other industrial/research space used in the Reuse Plan, actual revenues will be subject to appraisal and lease contracts;

** assumption based on 700 students and faculty;

*** estimates of land value.

Source: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.

the proposed activities do not change. For Warminster, there is a major shift reducing the industrial/office park and university components and substituting the golf/residential element. The fiscal consequence is expected to reduce the earned income tax revenues by about half, but to somewhat compensate for this reduction by increases in real property tax from the expanded golf/residential component. Under the Reuse Plan Warminster would receive estimated annual taxes of \$2.98 million, plus PILOT from the university component; under the Residential Alternative, Warminster would receive \$2.84 million but without any additional PILOT from the university component.

Housing

Many of the same housing assumptions that are adopted above for the Reuse Plan may be applied to the Residential Alternative. The total number of new housing units accommodated at the base would be increased from 175 under the Reuse Plan to 575 under the Residential Alternative. The total number of new units attributable to the new employment at the base should, however, be reduced because the anticipated employment would only be about 66 percent (at approximately 5,000 rather than 7,600) of that under the Reuse Plan. Moreover, the 400 additional units proposed under the Residential Alternative will likely accommodate a share of the new workers and their households. While it is inherently uncertain who will occupy these new units, at a minimum the new units would reduce the need for increases in the housing supply elsewhere to accommodate both the new workers at the base and the population growth anticipated for Bucks County.

An order of magnitude estimate of the new housing units induced by the Residential Alternative is adopted here at 1,800 units. These would be distributed around the county in the same ratios used in the foregoing section on the Reuse Plan. Table 4.2-13 shows this estimated assignment to the planning areas and particularly within the Northampton Planning Area, which is estimated to receive 607, or 33.7 percent, of the new units. Again, the conservative assumptions made above, that all the housing development induced by the redevelopment of NAWCAD will be located in Central Bucks County and all in the decade 2000 to 2010, are applied. In reality, the housing development is likely to spread over a longer time frame, and over a broader geographic region. As with the Reuse Plan, the Residential Alternative is unlikely to present unexpected or problematic growth to Bucks County. The estimated housing development is well within projected growth over the period.

4.2.4 Aviation Alternative

Demography

The Aviation Alternative would introduce no new residents to the site, but it would increase the number of anticipated jobs to a total of approximately 9,200.

Table 4.2-13

**Assignment of Residential Alternative-Induced Housing to Central Bucks County
(Middle Range Projections 2000-2010)**

Planning Area	Projected Growth 2000-2010		Assignment of 1,800 Housing Units
	Housing Units	%	
Doylestown	4,950	37.0	666
Buckingham	970	7.2	130
Solebury	620	4.6	83
Northampton	4,500	33.7	607
Newtown	2,340	17.5	315
Total	13,380	100	1,799
Within Northampton Planning Area			
Ivyland	10	0.1	2
Northampton	3,220	24.1	434
Upper Southampton	330	2.5	45
Warminster	180	1.3	23
Warwick	760	5.7	103
Note: Numbers may not add due to rounding. Source: Housing projections from Bucks County Planning Commission, Bucks County Continuum, 1994.			

Employment and Income

The employment and earnings estimated for the Aviation Alternative are shown in Table 4.2-14. Direct employment at full build-out is seen to be 9,185, with associated earnings of over \$251 million. In addition to the permanent jobs, there would be temporary jobs generated by the construction activity anticipated in the Aviation Alternative and indirect employment generated as the earnings from the construction employment circulate in the regional economy. Capital expenditures for infrastructure elements (new roads, utilities, etc.) are likely to be relatively similar to the Reuse Plan's estimate of \$21.2 million.

Other construction costs are identified in Table 4.2-15 using the same construction cost assumptions used for the other alternatives. Total construction costs are estimated at \$142.3 million. An estimated 1,430 direct construction jobs and 1,942 indirect jobs would be generated from the temporary construction. Earnings for the construction phase are estimated at \$46.2 million for direct employment and \$56 million for indirect employment. As noted in the section on employment for the Reuse Alternative, these jobs would be phased in over the entire development period with several peaks and troughs likely.

The permanent employment proposed under the Aviation Alternative was noted above to total 9,185 jobs. The spending by the households of these employed workers will also generate additional secondary economic activity. Estimates of these secondary jobs and earnings have been derived from the RIMS II model for the Philadelphia region, as used in the employment sections of the other alternatives. Again, the categories of employment are allocated to their respective standard industrial classification codes (SICC) in the detailed 471 industry input/output (I/O) matrix that is then used to obtain the industry-specific direct-effect multipliers. The total employment and earnings generated by the proposed activity is computed and indirect effects are obtained by deducting the direct employment and earnings. Total direct and indirect employment is computed at 20,873 jobs, with indirect employment representing 56 percent of this at 11,688 jobs. Total earnings are projected to be almost \$462 million, of which \$211 million are generated indirectly. It should be emphasized that these numbers are in 1995 dollars but the volume is based on the full build out scenario in year 2011. As the proposed reuse development is phased in, the indirect jobs and earnings would grow proportionately.

Fiscal Impacts

As with the Reuse Plan, the Aviation Alternative suggests substantial fiscal benefits from the redevelopment of NAWCAD. Under the Aviation Alternative, the estimated number of jobs generated would be 9,185, which is 21 percent greater than under the Reuse Plan (although very similar to the industrial variant that replaced the university in the Reuse Plan). Earnings are estimated at almost \$251 million, about \$52 million more than the Reuse Plan (and again very similar to the industrial variant of the Reuse Plan).

Table 4.2-14

Aviation Alternative Anticipated Employment & Estimated Earnings

Employment Category	Jobs	Estimated Mean Annual Wage (\$ 1995)	Estimated Total Annual Earnings (\$ 1995)
Multi-Business Complex	2,625	30,056	78,897,000
Industrial	5,605	27,100	165,987,500
Business	520	23,338	12,135,760
University	115	30,056	3,456,440
Aviation	40	27,100	1,084,000
Hotel/Conference	260	12,501	3,250,208
Parks and Recreation	20	23,504	470,080
Totals	9,185		251,188,988
Based on: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995 (BRAC 95 assumptions add 225 jobs to the multi-business complex and 115 jobs to the university and are derived from interviews with Reuse Authority staff); and US Dept. Of Labor, Bureau of Labor Statistics, Employment and Earnings, August 1995.			

Table 4.2-15

Aviation Alternative Estimated Construction Costs

Project	Est. Construction Costs (\$millions)
Industrial	90.0
Business	10.4
Parks and Recreation	3.0
Aviation	7.2
Hotel/Conference	10.5
Site Improvements	21.2
Totals	142.3
Based on: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.	

Using the assumptions shown in the section above on the fiscal impacts of the Reuse Plan, and projecting them to the program proposed under the Aviation Alternative, projections of real property taxes are shown in Table 4.2-16. Annual real property tax collections of \$1.9 million plus PILOT payments are expected. Following the assumptions made in Table 4.2-6, these would be distributed to the relevant jurisdictions on the basis of 7.4 percent to the township, 74.3 percent to the school district, and 18.2 percent to the county. The PILOT payments would be subject to negotiation and the amount of revenues that would be generated by these functions is unknown at this time. The aviation activities are placed under PILOT at this time because the ultimate ownership status of this activity is not determined.

As with the Reuse Plan, Warminster would also benefit from an earned income tax of one percent applied to the earnings of the projected employees at the redeveloped base. With anticipated earnings at full build-out of almost \$251 million (1995 dollars), Warminster could anticipate annual earned income taxes of \$2.5 million, a sum that would represent an 80 percent increase on the earned income tax revenue projected in Warminster's 1995 budget. Additional local revenues would flow from Business and Occupational Privilege Taxes, as well as from other minor taxes and fees, although no estimate of these revenues is made at this time because of their relatively minor and uncertain nature. Additional tax revenues would be generated on a temporary basis during the reconstruction of the base.

Employees of the redeveloped NAWCAD under the Aviation Alternative are projected to number 9,185 at full build-out. Depending on where these employees and their households reside, and to the extent they generate new residential construction, additional real property taxes would flow to local government. An estimate of 3,000 new housing units induced by the redevelopment was used in the section on the Reuse Plan above and applied in the analysis of demographic, housing, and community service impacts. Similar distribution assumptions would apply to shares of real property taxes collected from these new units, but because of the uncertainty of exactly where such new residents would actually live, no estimate is made of what the specific fiscal implications would be.

Housing

Many of the same housing assumptions that are adopted above for the Reuse Plan may be applied to the Aviation Alternative. Although the total number of new housing units accommodated at NAWCAD would decline to zero, the total number of new units attributable to the new employment would be increased because the anticipated employment would be increased by approximately 1,600. Whereas 3,000 new housing units were anticipated to be induced by the Reuse Plan, approximately 4,600 would be induced by the Aviation Alternative. These would be distributed around the county in the same ratios as for the Reuse Plan. Table 4.2-17 shows this estimated assignment to the planning areas, particularly within the Northampton Planning Area, which is estimated to receive 1,550, (33.7 percent) of the new units.

Table 4.2-16

Aviation Alternative Plan Revenues and Property Taxes (Years 1-15)

Use	Demand Forecast	Land Sales (totals)**	Rent (per year)	Property Taxes (per year)
Multi-Business Complex	1.3 million sq ft (128,000 sq m)		\$3,200,000	PILOT
Industrial/Business	284 acres (115 hectares)	\$18,460,000		\$1,776,000
Aviation	168 acres (68 hectares)	\$10,920,000		PILOT
Hotel/Conference	10 acres (4 hectares)	\$1,000,000		\$168,457
Parks and Recreation	162 acres (66 hectares)			\$0
Inertial Lab	25,000 sq ft (2,300 sq m)		\$74,500*	PILOT
Dynamic Flight Simulator	72,000 sq ft (6,700 sq m)		\$216,000*	PILOT
Grand Total		\$30,380,000	\$3,673,000	\$1,944,457 plus PILOT
<p>Notes: PILOT = Payment in lieu of taxes, to be negotiated; Land use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions; Land use acreage and amount of development are approximate based on estimates made for a long-term development plan that is subject to change. Numbers may not total exactly due to rounding and metric conversions; * Based on assumption of \$3 per sq ft used for other industrial/research space used in the Reuse Plan, actual revenues will be subject to appraisal and lease contracts; ** estimates of land value at \$65,000 per acre as in the Reuse Plan. Based on: Reuse Plan, Naval Air Warfare Center, Bucks County, Pennsylvania, March 1995.</p>				

Table 4.2-17

**Assignment of Aviation Alternative-Induced Housing to Central Bucks County
(Middle Range Projections 2000-2010)**

Planning Area	Projected Growth 2000-2010		Assignment of 4,600 Housing Units
	Housing Units	%	
Doylestown	4,950	37.0	1,703
Buckingham	970	7.2	332
Solebury	620	4.6	212
Northampton	4,500	33.6	1,550
Newtown	2,340	17.5	806
Total	13,380	100	4,600
Within Northampton Planning Area			
Ivyland	10	0.1	4
Northampton	3,220	24.1	1,109
Upper Southampton	330	2.5	115
Warminster	180	1.3	60
Warwick	760	5.7	262
Source: Housing projections from Bucks County Planning Commission, Bucks County Continuum, 1994.			

The assumptions that all the housing development induced by the redevelopment of NAWCAD will be located in Central Bucks County and all in the decade 2000 to 2010, are consecutive. In reality, the housing development is likely to spread over a longer time frame, and over a broader geographic region. As with the Reuse Plan, the Aviation Alternative is unlikely to present unexpected or problematic growth to Bucks County; however, in this case the estimated induced housing development accounts for about one-third of projected growth in the county over the period.

4.3 Community Services

4.3.1 No Action Alternative

Under the no action alternative there would be no redevelopment at the base. There would thus be little or no new demand created for community services under the no action alternative. The six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex to be transferred to NASJRBWG would continued to be occupied by the Navy. It is assumed that local municipalities would provide police and fire protection services to this housing. These conditions describe the baseline condition assumed for the no action alternative.

4.3.2 Reuse Plan

The geographic assignment of new housing units attributable to the redeveloped NAWCAD is also important for assessing any impacts on local community services. Certain community services would relate directly to the NAWCAD facility itself, such as the emergency services of police, fire, and ambulance, but other services, such as education and health care, would relate more to the locations of induced resident workers and their families.

The numbers of new households and residents associated with the in-migrating workers at the redeveloped NAWCAD are estimated at 3,000 and 8,400, respectively (Table 4.3-1); and the direct housing developed under the Reuse Plan totals 175 units accommodating an estimated population of 490.

Schools

In 1990, the school-age population (using census age groups ages 5-19) accounted for nearly 21 percent of the Bucks County population. This proportion is projected to decline to 19 percent by year 2020 (Bucks County Planning Commission, 1994). Applying an assumption of 20 percent of the new population as being of school-age implies there would be 1,778 new students in the various school districts at full build-out of the redeveloped NAWCAD, generated by both the new workers and the new housing on-site at NAWCAD. The distribution of the student population among the three school districts serving central Bucks County in the school year 1990-91 is shown in Table 4.3-2.

The table also shows that the distribution of the student population among the grades is approximately 50 percent in elementary, and just under 25 percent in both middle and high schools. Students attending private schools in Bucks County represent 20 percent of the total student population. Applying these historical distributions to the projected student population from the in-migrating NAWCAD workers and the directly created new units in Ivyland implies that there will be

Table 4.3-1

**Assignment of Reuse Plan-Induced Housing and Residents to Central Bucks County
(Middle Range Projections 2000-2010)**

Planning Area	Assignment of 3,000 Induced Housing Units (2000-2010)			Assignment of 175 Direct Housing Units		
	Units	Estimated Population	As % of Year 2010 Housing	Units	Estimated Population	As % of Year 2010 Housing
Doylestown	1,110	3,108	3.9	0	0	0.0
Buckingham	217	609	2.9	0	0	0.0
Solebury	139	389	2.8	0	0	0.0
Northampton	1,008	2,825	2.4	175	0	0.4
Newtown	525	1,469	3.3	0	0	0.0
Total	3,000	8,400	3.0	175	490	0.2
Within Northampton Planning Area						
Ivyland	2	6	1.1	175	490	83.3
Northampton	722	2,022	3.7	0	0	0.0
Upper Southampton	74	207	1.1	0	0	0.0
Warminster	40	113	0.3	0	0	0.0
Warwick	170	477	4.5	0	0	0.0
Source: Based on Bucks County Planning Commission, Bucks County Continuum, 1994.						

Table 4.3-2

Student Population Central Bucks County (1990-1991)

Public School Districts							Total Bucks County	
Grades	Centennial		Central Bucks		Council Rock			
	Students	%	Students	%	Students	%		
Elementary 1-6	2,878	50.1	4,788	51.3	4,580	49.2	35,728	51.1
Middle 7-9	1,375	24.3	2,265	24.3	2,381	25.6	18,012	25.7
High 10-12	1,402	24.8	2,279	24.4	2,353	25.3	16,248	23.2
Total	5,655	100	9,332	100	9,314	100	69,988	100
Private Schools								
Grades 1-8							12,930	72.4
Grades 9-12							4,940	27.6
Total							17,870	100
Source: Bucks County Planning Commission, Bucks County Continuum, 1994 Numbers may not total due to rounding								

an increment of 360 new students to private schools (of which 260 would be in grades 1 through 8 and 100 in grades 9 through 12) and 1,418 new students to public schools (of which approximately 709 would be in elementary grades, 355 in middle grades, and 355 in high school grades). If the distribution of new students were to follow the pattern projected for population in Table 4.3-2, the new public school students would be allocated 11 percent to the Centennial District, 49 percent to the Central Bucks District, and 40 percent to the Council Rock District. Applying these assumptions results in a projected distribution of students to each of the districts as shown in Table 4.3-3.

Table 4.3-3

Projected Distribution of New Student Population

Grades	Students in Public School Districts		
	Centennial	Central Bucks	Council Rock
Elementary 1-6	78	347	284
Middle 7-9	37	164	134
High 10-12	37	164	134
Total	152	675	552

If these projections are compared to recent student populations in the three school districts, as shown in Table 4.3-2, the very small increment that these new students represent is apparent. In the Central Bucks District, which is projected to receive the largest number of new students (675 students), this would represent an increase of 7.2 percent over the 1990-91 student population; for Council Rock the increase would represent 6 percent, and for Centennial 2.7 percent. In historical perspective, the Centennial District lost 31.3 percent of its student population over the course of the 1980s, and the Central Bucks District lost 6.5 percent. On the other hand, Council Rock gained 9.8 percent over the same timeframe (Bucks County Planning Commission, 1994). Council Rock has built three new elementary schools and two large additions over recent years and is developing a new capital plan to deal with continued growth. According to Council Rock School District Superintendent David Blatt, the district has been "growing" 300 students per year (Blatt, December 18, 1995). The assignment of 552 students to this district phased in over a period of 20 years is not expected to provide any unusual difficulty to handle.

Among the basic assumptions utilized in the projected student distributions is the assignment of the entire increment of students (attributable to the new Reuse Plan workers) to these three central Bucks County school districts. In reality, these students are likely to be distributed among other school districts in Bucks County, Montgomery County, and elsewhere. Moreover, the timeframe for this full build out scenario extends some 15 to 20 years and these student population increments would not be reached until after year 2010, permitting substantial lead times for school districts to prepare and incorporate the base reuse impacts and other unrelated demographic changes in the region.

Health Care

Subchapter 3.3.2 of this document examined the hospitals available in lower Bucks County and Table 3.3-2 indicated the numbers of licensed beds and occupancy rates. Warminster General Hospital is the closest to NAWCAD and provides 200 beds with an occupancy rate of 66.8 percent. The Bucks County Planning Commission's 1991 report on Health Care Facilities indicated that demand projections for medical/surgical and pediatric units in general hospitals in Bucks County would decrease from 855 beds in 1988 to 794 beds in 2000 (Bucks County Planning Commission, 1991). The projected decline is based largely on trends of reduced stays in hospitals. While uncertainty prevails over exactly what populations will need to be provided for in the future, the present availability of hospital beds and the possible decline in demand indicate that the redevelopment of NAWCAD, and its associated population, would be unlikely to present any particular problems for the county's health care facilities.

Public Safety and Emergency Services

The redevelopment of NAWCAD will potentially present an increase in service demands on the surrounding communities' safety and security services. Subchapter 3.3.3 of this document inventoried the relevant services in proximity to NAWCAD. Discussions with township representatives (Hess, January 26, 1996; and McClellan, January 5, 1996) indicated no problems in meeting this future demand.

In the case of Warminster, recent declines in population had reduced service demand (and the revenues to support these services); consequently, increases in population and the revenue base would be welcome in the township. One particular issue is related to the Navy's closure of the Fire/Crash House on the base. The Navy had, until late 1995, mutual aid agreements with local fire services where Navy fire crews were typically the first-on-the-scene respondent crews during day-time emergencies, because they were full-time crews in constant preparedness, whereas local crews are volunteers and would typically have to leave their jobs and assemble prior to arrival at the scene. Warminster Township is currently considering full-time fire department employees, particularly for the day shift, due in part, to both local need and the closure of NAWCAD (Hess, January 26, 1996). Also, Ivyland borough officials indicated the need to expand its fire and police services with the redevelopment of NAWCAD under the Reuse Plan.

Northampton is in a population growth phase and does not see the proposed reuse of the base as presenting particular problems for safety and security services. The township is intending to utilize a two-acre (one-hectare) area of the base on New Road for a proposed new fire house that would be oriented to meeting the growing population needs in the western portion of the township (McClellan, January 5, 1996).

Ivyland fire protection is provided by a 20-plus volunteer force using 20-year old equipment, and its police force comprises five part-time police officers using two cars. Statements from borough

officials indicated that there would be a need to expand these services with the redevelopment of NAWCAD envisioned in the Reuse Plan (Ivyland officials, April 4, 1996). The return of formerly tax-exempt Navy lands to local tax rolls would provide additional revenues to assist with financing any necessary expansion of these services.

Parks and Recreation

The Reuse Plan proposes the development of substantial park facilities, totaling 250 acres (101 hectares). Warminster Township would operate 122 acres (49 hectares) of the proposed parkland and Northampton Township would operate 128 acres (52 hectares) (less four acres [two hectares] more recently proposed for a fire house and water pump/well).

While the county Reuse Plan allocates 122 acres (49 hectares) to Warminster, the township has recently submitted a request pursuing a public benefit transfer of 250 acres (101 hectares) for a multi-use recreational facility (December 27, 1995 application to the Federal Lands Reuse Authority of Bucks County). The proposed plan incorporates a multi-use stadium, gymnasium/auditorium, athletic fields, and passive recreation facilities including nature and picnic areas, and would be oriented to and integrated with the existing Munro and Werner town parks. The difference in acreage between the township's proposal and the Reuse Plan is largely accounted for by the lands allocated in the Reuse Plan to Educational/Institutional uses. While the use of these particular lands may not be finalized for some time, and also relate to the need for hazardous waste clean-up, this EIS analysis assumes that the county Reuse Plan allocations of parkland apply.

The educational/institutional uses (as well as the possible industrial use of this parcel discussed above) represents more of an intense use or "worse-case" scenario than the recreational use of the land. Even so, the Reuse Plan's provision of at least 122 acres (49 hectares) for new township park and recreational use is a major increment to the township's supply of parkland. Existing Warminster Township and Centennial School district lands devoted to park and recreation use total 265 acres (107 hectares) (Bucks County Continuum, 1994).

Northampton Township has submitted an application to the US Department of the Interior, National Park Service for the Federal Lands-To-Parks Program (September 1, 1995) that covers the 128 acres (52 hectares) allocated in the county Reuse Plan. The plan calls for three soccer fields, two softball and two youth baseball fields, all served by two paved parking lots and accessed from Hatboro Road, and miscellaneous facilities including four tennis courts, two volleyball courts, two basketball courts, one adult baseball field, and one softball field. Passive recreation will be served by another parking lot off New Road and include a refreshment stand and rest room, picnic grove, and some 20 acres (8 hectares) of passive open space.

4.3.3 Residential Alternative

Many assumptions and estimates developed in the section above addressing the impacts of the Reuse Alternatives may also be applied for the Residential Alternative. The primary adjustments necessary are to increase the number of direct residents on the former base and decrease the numbers of induced residents generated by employment at the redeveloped base. Table 4.3-4 shows both the direct increases in population from the housing development and the induced increases from employment. The estimated new population occupying the new housing on the former base is 1,610; this compares to 490 that would occupy the new housing proposed in the Reuse Plan in Ivyland. The induced housing developed elsewhere in Bucks County is estimated to generate an additional population of 5,040 under the Residential Alternative compared to 8,400 under the Reuse Plan. In total, therefore, direct and induced housing would be expected to generate a new population of 6,650 to the Central Bucks region compared to 8,890 under the Reuse Plan.

Schools

Adopting similar assumptions of the proportion of school-age children, their distribution to public and private schools, and the grades to which they would be assigned (as in the section above on the Reuse Plan) results in a total of 1,330 public school children estimated under the Residential Alternative, which is 6.2 percent fewer than the 1,418 anticipated under the Reuse Plan. There would be less school-age children under the Residential Alternative (even though there will be 400 more residential units on-site) because anticipated employment (and therefore number of people with families) would only be about 66 percent (at approximately 5,000 rather than 7,600) of that under the Reuse Plan. Impacts on schools in general would, therefore, be less than the Reuse Plan. However, the model needs to be adjusted to account for a greater share allocated to the Centennial District because of the greater amount of on-site residential at the base. The projected school population increase for Centennial would be a total of 218, a projected increment of 3.8 percent on the 1991 student population, compared to 2.7 percent under the Reuse Plan. The other school districts would receive proportionately fewer students. The projected distribution among the districts and grades is shown in Table 4.3-5

With the same caveats noted for the Reuse Alternative above, the absorption of these students into the Centennial and Central Bucks districts that have been losing school-age populations is not expected to create major problems over the 15-year development period. With respect to the growing Council Rock district, the Residential Alternative generates even fewer students than the Reuse Plan, and therefore no adverse impact would be anticipated.

Health Care

The Residential Alternative is expected to generate a direct and induced new population of 6,627 in Central Bucks County, or 25 percent fewer than under the Reuse Plan. In consequence, the anticipated impacts upon health care service would be that much less than discussed above under the

Table 4.3-4

Assignment of Residential Alternative Direct and Induced Housing and Residents to Central Bucks County
(Middle Range Projections 2000-2010)

Planning Area	Assignment of 1,800 Induced Housing Units (2000-2010)			Assignment of 575 Direct Housing Units			Totals		
	Units	Population	As % of Year 2010 Housing	Units	Population	As % of Year 2010 Housing	Units	Population	As % of Year 2010 Housing
Doylestown	666	1,865	2.3	0	0		666	1,865	2.3
Buckingham	130	365	1.7	0	0		130	365	1.7
Solebury	83	234	1.7	0	0		83	234	1.7
Northampton	604	1,677	1.4	575	1,610		1,179	3,282	2.8
Newtown	315	881	2.0	0	0		315	881	2.0
Total	1,798	5,022	1.8	575	1,610		2,373	6,627	2.4
Within Northampton Planning Area									
Ivyland	1	4	0.6	175	490		176	493	84.0
Northampton	433	1,213	2.2	0	0		433	1,213	2.2
Upper Southampton	44	124	0.6	0	0		44	124	0.6
Warminster	23	68	0.2	400	1,120		423	1,184	3.5
Warwick	103	268	2.7	0	0		103	268	2.7
Based on Bucks County Planning Commission, Bucks County Continuum, 1994; and Reuse Plan, Bucks County, PA, March 1995.									

Table 4.3-5

Residential Alternative Projected Distribution of New School Population

Grades	Public School Districts		
	Centennial	Central Bucks	Council Rock
	Students		
Elementary 1-6	144	287	235
Middle 7-9	37	164	134
High 10-12	37	164	134
Total	218	615	503

impacts of the Reuse Plan. No particular problems were anticipated under the Reuse Plan and similarly none are expected under the Residential Alternative.

Public Safety and Emergency Services

The discussion above on the impacts of the Reuse Plan on the safety and emergency services in the surrounding community anticipated no major problems in meeting the anticipated growth in demand created by the redevelopment of NAWCAD. While the Residential Alternative shifts some of the development from new employment to new residents at the base, only modest net shifts in demand for these services could be predicted. In general, the increase in the local tax base from private redevelopment of the base and the new wage tax revenues are expected to support the small increments in service capacity that would be needed.

Parks and Recreation

The Residential Alternative would provide an increment of 210 acres (85 hectares) of new public park and recreation land to the community. The portion in Northampton Township would remain the same as proposed in the Reuse Plan, whereas the portion in Warminster Township would be reduced from 122 acres (49 hectares) to 86 acres (35 hectares) under the Residential Alternative. The substitution of a 250-acre (101-hectare) golf-oriented residential community would account for the reduction in the Warminster portion. Inherently, the golf/residential uses will provide an attractive recreational amenity for the community. The provision of 210 acres (85 hectares) of new public parkland would represent a major increase in the availability of public parkland in this area of Bucks County and in the Warminster and Northampton townships.

4.3.4 Aviation Alternative

As with the other alternatives examined, certain community services would relate directly to the NAWCAD facility itself, such as the emergency services of police, fire and ambulance, but other services, such as education and health care, would relate more to the locations of induced resident workers and their families. The numbers of new households and residents associated with the immigrating workers at the redeveloped NAWCAD under the Aviation Alternative are estimated at 4,600 and 12,880, respectively.

Schools

Adopting similar assumptions of the proportion of school-age children, their distribution to public and private schools, and the grades to which they would be assigned (as in the section above on the Reuse Plan) results in a total of 2,576 school-age children estimated under the Aviation Alternative, 45 percent greater than under the Reuse Plan. Impacts on schools in general would, therefore, be greater than the Reuse Plan, although very similar to the industrial variant of the Reuse Plan. Variations also occur because there would be no new residents at the former base that would have been assigned to the Centennial School District. The projected school population increase for Centennial would be a total of 227, a projected increment of 4 percent on the 1991 student population, compared to 2.7 percent under the Reuse Plan. The projected distribution among the public school districts and grades is shown in Table 4.3-6. Parochial schools are projected to receive 515 new students.

With the same caveats noted for the Reuse Plan above, the absorption of these students into the Centennial and Central Bucks districts that have been losing school-age populations is not expected to create major problems over the 15-year development period. With respect to the growing Council Rock district, the Aviation Alternative generates 824 students but, as noted in the discussion on schools in the Reuse Alternative, Council Rock has been absorbing 300 new students per year and the projected growth from the Aviation Alternative is well within their projected growth trends.

Table 4.3-6

Aviation Alternative Projected Distribution of New School Population

Grades	Students in Public School Districts		
	Centennial	Central Bucks	Council Rock
Elementary 1-6	113	505	412
Middle 7-9	57	252	206
High 10-12	57	252	206
Total	227	1,009	824

Health Care

The Aviation Alternative is expected to generate an induced new population of 12,880 in Central Bucks County (as described at the beginning of this subchapter), or 53 percent greater than under the Reuse Plan. In consequence, the anticipated impacts upon health care service would be that much greater than discussed above under the impacts of the Reuse Plan. However, given the discussion on the declining demand for hospital beds in the section on the Reuse Plan, no particular problems are expected under the Aviation Alternative.

Public Safety and Emergency Services

The impacts analysis of the proposed Reuse Plan (Subchapter 4.3.2) on safety and emergency services in the surrounding community, indicated no major problems in meeting the anticipated growth in demand created by the redevelopment of NAWCAD. While the Aviation Alternative adds new employment at the base, it adds no new residents. Consequently, only modest net shifts in demand for these services are predicted. In general, the increase in the local tax base from private redevelopment of the base and the new wage tax revenues are expected to support the small increments in service capacity that would be needed. The induced worker population would be distributed about the region and would be characterized as employed workers paying local property and other taxes sufficient to support any increment in service demand that they create in their local communities.

Parks and Recreation

The Aviation Alternative would provide an increment of 162 acres (66 hectares) of new public park and recreation land to the community. The 124 acres (50 hectares) in Northampton Township would increase by 38 acres (15 hectares) (devoted to congregate housing in the Reuse Plan) as proposed in the Reuse Plan, whereas the portion in Warminster Township would be eliminated. The provision of 162 acres (66 hectares) of new public parkland would represent a major increase in the availability of public parkland in this area of Bucks County and especially for Northampton Township.

4.4 Transportation

In order to compare historical traffic volumes associated with NAWCAD to projected traffic volumes resulting from the three action alternatives, the number of trips generated at the time of the decision to close NAWCAD (April 1991) was computed. This was based on a total population of 38,900 at NAWCAD in April 1991 (civilian employees-2,600; military personnel-300; total annual incoming visitors-35,000; and on-board contractors-1,000) (Cody, July 22, 1996) and trip generation rates in *Trip Generation* (ITE, 1991). The number of trips generated were determined to be the following:

- 1,844 during the am peak hour;
- 1,844 during the pm peak hour; and
- 10,310 total daily trips.

4.4.1 No Action Alternative

In order to predict future traffic volumes under the no action alternative, it is necessary to document historical traffic conditions and changes in the study area as well as future changes in traffic generators (residential and employment centers that will likely be constructed, expanded or closed by the build year of 2010). A growth rate of one percent per year was chosen to account for general traffic growth in the area.

Several changes in traffic generation in the project area are expected to occur by 2010, including the following:

- Closure of NAWCAD - By the year 2010, NAWCAD will have completely closed. When the existing traffic data for this EIS were gathered, existing employment at NAWCAD was approximately 1,400 civilians. This reduction of 1,400 personnel translates into a reduction of 1,302 vehicle trips based on current modal splits (93 percent arrive by auto). Therefore, 1,302 daily inbound and outbound vehicle trips were removed from the network. Reductions in hourly trips were based on a two-hour arrival/departure pattern.
- Wal-Mart Retail Store - This development is located at the southeast corner of Street Road and Jacksonville Road in Warminster Township. This newly opened facility was not in operation when the traffic counting program was undertaken in April 1995. Therefore, impacts associated with the operation of the Wal-Mart store were added onto the future baseline traffic network. The number of trips generated by the development and the distribution of these trips were provided in the traffic study prepared for Wal-Mart (McMahon Associates, Inc., 1993). The trips for the Wal-Mart store have been surcharged onto the pm peak only, since the Wal-Mart store is

not open for business during the am peak hours and increase in traffic is therefore not expected at that time. The Wal-Mart study identifies 209 new vehicle trips entering and exiting during the pm peak.

The future baseline traffic network, therefore, uses the existing counts (taken in April 1995) as a baseline, provides one percent per year background growth, adds trips to account for development of the Wal-Mart store, and removes trips due to closure of NAWCAD under the no action alternative. The street network is assumed to remain similar to the existing network with the exception of minor signalization improvements at the Street Road/Jacksonville Road intersection. These improvements are programmed by PENNDOT and should be completed by 2004.

LOS Analysis

Capacity analysis and Level of Service (LOS) determinations for the future baseline (no action alternative) conditions were performed for the same intersections considered under existing conditions. Despite the closure of NAWCAD, background traffic growth and other nearby developments, such as the Wal-Mart store, would cause further degradations in LOS at the intersections studied. Poor operation (LOS E, or worse) would be expected at all study area intersections under the no action alternative. Table 4.4-1 presents the results of the future baseline capacity analysis for the am and pm peaks.

Public Transportation

The existing public transportation system provides convenient access to NAWCAD. Therefore, the closure of NAWCAD would likely result in subsequent decreases in transit ridership.

4.4.2 Reuse Plan

The proposed site development, in accordance with the proposed Reuse Plan, would result in the continued use and further development of the site for research and development, general industrial and office development, housing (both single-family and senior congregate care), and recreational uses.

Assumptions

As described in subchapter 2.3.3, approximately 84 acres (34 hectares) of the site were originally anticipated for educational/institutional use. However, based on discussions with the FLRA, a more likely scenario would be industrial development. Therefore, this traffic analysis has assumed the industrial option as a worst-case scenario.

Table 4.4-1

Summary of LOS Analysis - No Action Alternative

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
Bristol Road and Jacksonville Road (Location 1)								
EB	681	1.010	39.7	D	796	1.100	*	F
WB	579	1.664	*	F	659	1.783	*	F
NB	508	1.565	*	F	475	1.463	*	F
SB	555	1.338	*	F	598	1.412	*	F
Overall:			*	F			*	F
Bristol Road and Hatboro Road (Location 2)								
EB LT	700	-	5.2	B	792	-	6.8	B
WB TR	684	-	-	A	726	-	-	A
SB L	131	-	287.3	F	128	-	*	F
SB R	161	-	7.3	B	93	-	6.4	B
Overall:			21.0				43.0	
Street Road and Old York Road (Location 3)								
EB L	260	1.089	112.3	F	738	3.090	*	F
EB T	770	0.849	34.7	D	937	1.004	53.6	E
EB R	45	0.111	23.1	C	136	0.326	24.4	C
WB L	213	0.893	58.1	E	208	0.870	55.0	E
WB T	559	0.616	28.2	D	820	0.880	36.0	D
WB R	335	0.678	30.9	D	309	0.597	28.3	D
NB L	260	0.889	57.3	E	302	0.774	43.9	E
NB T	1026	0.993	48.3	E	889	0.980	48.7	E
NB R	181	0.302	22.2	C	71	0.187	23.7	C
SB L	154	0.525	40.2	E	355	0.908	54.7	E
SB TR	778	0.770	29.1	D	704	0.777	31.8	D
Overall:			42.3	E			*	F

Table 4.4-1

Summary of LOS Analysis - No Action Alternative

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	LOS	Appr. Volume	V/C Ratio	Stopped Delay	LOS
Street Road and Jacksonville Road (Location 4)								
EB L	44	0.242	26.7	D	129	0.706	35.5	D
EB T	964	0.957	34.5	D	1176	1.167	*	F
EB R	371	0.721	23.4	C	229	0.469	18.1	C
WB L	308	1.707	*	F	303	1.682	*	F
WB T	1065	1.057	59.0	E	959	0.952	33.7	D
WB R	201	0.294	16.5	C	363	0.688	22.3	C
NB L	220	1.605	*	F	360	2.632	*	F
NB T	184	0.429	20.1	C	458	1.070	78.1	F
NB R	53	0.141	18.0	C	164	0.455	20.5	C
SB L	161	1.223	*	F	216	1.639	*	F
SB T	466	1.081	82.4	F	168	0.390	19.8	C
SB R	254	0.572	22.3	C	31	0.032	17.5	C
Overall:			*	F			*	F
Street Road and Second Street Pike (Location 5)								
EB L	76	0.469	16.2	C	150	0.789	29.2	D
EB TR	962	0.912	31.0	D	1055	1.017	49.3	E
WB L	93	0.556	18.9	C	105	0.538	18.5	C
WB TR	860	0.784	24.5	C	1233	1.167	*	F
NB L	59	0.330	14.9	B	252	1.031	73.6	F
NB TR	422	0.764	24.6	D	693	1.143	*	F
SB L	213	0.991	62.2	F	180	0.729	22.7	C
SB TR	555	0.856	29.2	D	556	0.944	40.9	E
Overall:			29.1	D			*	F
County Line Road and Blair Mill Road (Location 6)								
EB TR	862	0.849	25.3	D	1195	1.181	*	F
WB L	489	0.994	48.3	E	402	1.024	61.3	F
WB T	813	0.413	5.6	B	940	0.531	8.6	B
NB	385	0.967	51.4	E	687	1.275	*	F
Overall:			26.8	D			*	F

Table 4.4-1

Summary of LOS Analysis - No Action Alternative

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
County Line Road and Old York Road (Location 7)								
EB L	49	0.156	22.6	C	139	0.437	24.0	C
EB TR	863	0.985	44.4	E	1056	1.133	*	F
WB L	320	1.116	*	F	438	1.463	*	F
WB TR	993	1.200	*	F	1086	1.182	*	F
NB L	190	0.931	55.9	E	138	0.688	34.2	D
NB T	526	0.765	26.8	D	518	0.721	26.8	D
NB R	350	1.014	67.8	F	303	0.758	31.2	D
SB L	59	0.294	25.7	D	106	0.532	29.6	D
SB T	444	0.675	24.9	C	785	1.142	*	F
SB R	75	0.249	20.9	C	54	0.139	21.4	C
Overall: 95			*	F			*	F
County Line Road and Jacksonville Road (Location 8)								
EB	1020	0.741	13.3	B	1087	1.350	*	F
WB LT	907	0.704	12.5	B	1096	0.830	17.0	C
WB R	320	0.286	8.5	B	247	0.274	9.6	B
NB	408	0.898	35.8	D	468	1.109	91.9	F
SB	779	0.872	25.2	D	889	0.914	27.0	D
Overall:			18.4	C			*	F
Notes: NB-Northbound; SB-Southbound; EB-Eastbound; WB-Westbound								
L-Left turn; R-Right turn; T-Through								

The proposed Reuse Plan would also provide additional secondary access points to the site. In addition to the existing access along Jacksonville Road, new entrances along Bristol Road and Street Road are anticipated.

The following assumptions have been used in the development of these trips:

- Employee-based trips have assumed an absenteeism rate of ten percent;
- The existing modal split as noted in the NAWCAD Master Plan (1991) is approximately 95 percent private automobile use. Therefore, for development of project generated vehicle trips, a 95 percent auto use has been assumed;
- All employees have been assumed to work within one shift with a two-hour arrival pattern during the am and pm peak periods; and
- Trips generated by the hotel/conference, residential, and congregate care land uses are based on rates denoted in *Trip Generation* (ITE, 1991).

The development of trips generated by the proposed Reuse Plan were distributed throughout the roadway network based on the Journey to Work data for existing employees at NAWCAD. Distribution of these trips also accounted for the new access points proposed in the Reuse Plan. Based on information provided by the FLRA, NAWCAD employees commuting to the base live in the following areas: Bucks County-58 percent; Montgomery County-23 percent; Philadelphia County-9 percent; Delaware County-2 percent; New Jersey-3 percent; and other-4 percent. The distribution of trips on the local street network is provided in Figure 4.4-1 (Vehicle Trip Distribution).

Results

The development of trips generated by the Reuse Plan has been based on the anticipated number of employees and trip generation rates in *Trip Generation* (ITE, 1991). Table 4.4-2 provides a summary of the trips that would be generated by the Reuse Plan. The proposed reuse of the site would generate the following trips to the site: 3,721 additional peak hour trips (3,513-enter and 208-exit) would be generated during the am peak hour and 3,826 additional trips (281-enter and 3,545-exit) during the pm peak, compared to the no action alternative. These trips were applied to the existing commuter am and pm peak hours. The proposed Reuse Plan would generate 26,410 total daily trips.

Capacity analyses were performed for the same intersections considered under existing and future baseline conditions. The additional trips generated by the Reuse Plan would create considerable traffic delays at all study area intersections, since the existing street network offers limited residual capacity. The results of the capacity analyses are provided in Table 4.4-3. As indicated in the table, under the Reuse Plan, all intersections would operate at unacceptable levels (LOS F) during the peak hours with extensive delays to be expected at all study area intersections. As noted in Table 3.4-1,

Vehicle Trip Distribution

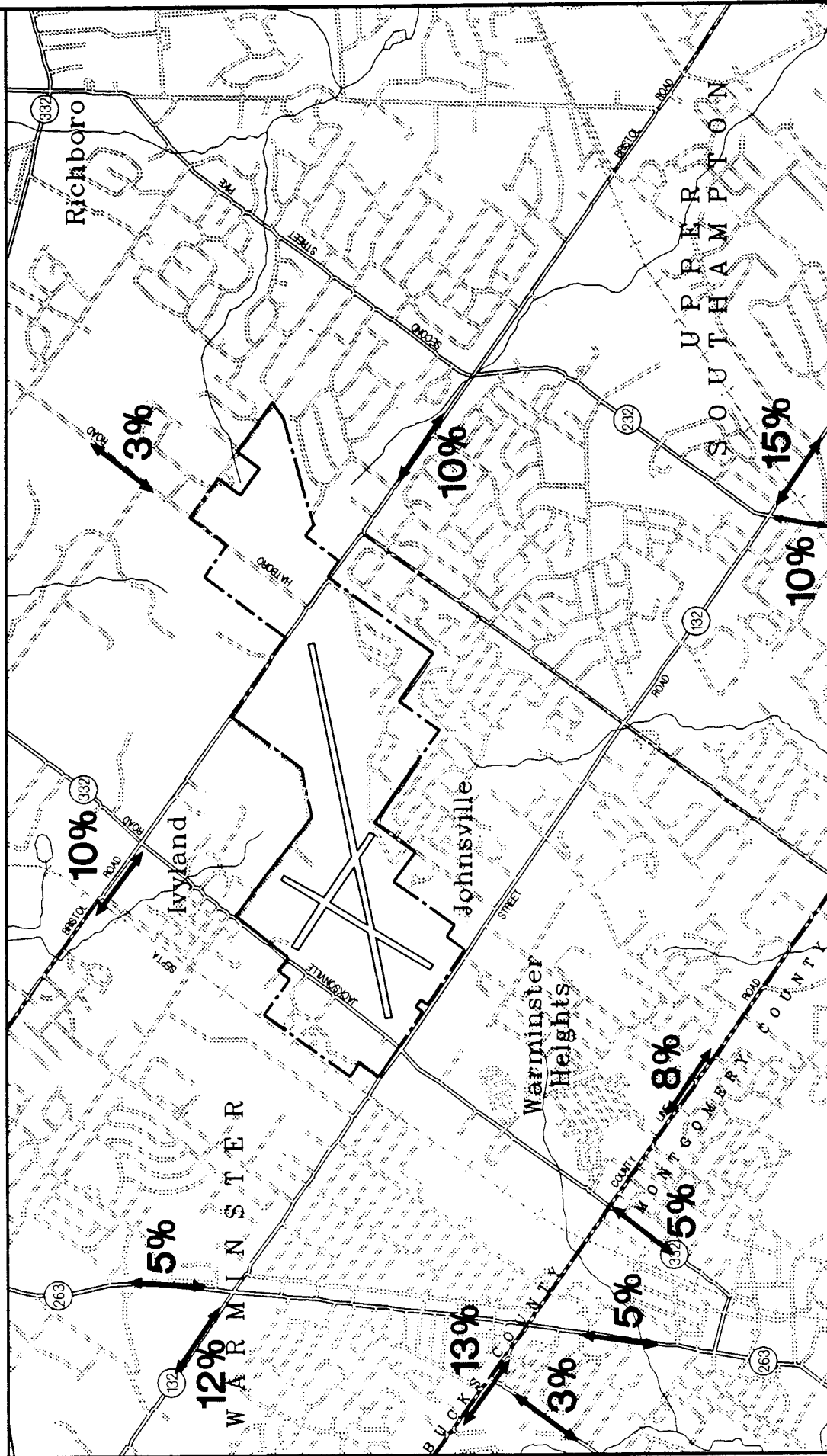


Figure 4.4-1

Table 4.4-2

Generated Vehicle Trips
Reuse Plan

Land Use	Number of Employees	Number of Dwelling Units	Vehicle Trips Generated			
			AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Multi-Business	2400		1026	0	0	1026
Industrial/Business	3370		1441	0	0	1441
Hotel/Conference		100 beds	108	71	112	96
Residential		175	34	99	116	63
Park/Recreation	25		11	0	0	11
Congregate Care		500 beds	38	38	53	53
University/Industrial	2000		855	0	0	855
Total peak hour trips generated			3513	208	281	3545

Table 4.4-3

Summary of LOS Analysis - Reuse Plan

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
Bristol Road and Jacksonville Road (Location 1)								
EB LTR	1266	1.802	*	F	825	1.266	*	F
WB LTR	793	4.051	*	F	1248	4.859	*	F
NB LTR	704	2.144	*	F	866	4.632	*	F
SB LTR	607	1.421	*	F	600	1.249	*	F
Overall:			*	F			*	F
Bristol Road and Hatboro Road (Location 2)								
EB LT	731	-	6.6	B	1012	-	8.8	B
WB TR	830	-	-	A	754	-	-	A
SB L	147	-	*	F	150	-	*	F
SB R	238	-	19.8	C	127	-	226.0	F
Overall:			*	F			*	F
Street Road and Old York Road (Location 3)								
EB L	260	1.089	112.3	F	738	3.090	*	F
EB T	1190	1.311	*	F	982	1.053	67.7	F
EB R	45	0.111	23.1	C	136	0.326	24.4	C
WB L	213	0.893	58.1	E	393	1.647	*	F
WB T	596	0.656	28.9	D	1242	1.332	*	F
WB R	341	0.693	31.4	D	415	0.852	39.5	D
NB L	260	0.889	57.3	E	302	0.774	43.9	E
NB T	1026	0.993	48.3	E	889	0.980	48.7	E
NB R	364	0.759	31.8	D	79	0.210	23.9	C
SB L	259	0.886	56.9	E	359	0.919	56.3	E
SB TR	778	0.770	29.1	D	704	0.777	31.8	D
Overall:			*	F			*	F

Table 4.4-3

Summary of LOS Analysis - Reuse Plan

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
Street Road and Jacksonville Road (Location 4)								
EB L	724	3.967	*	F	159	0.873	50.8	E
EB T	965	0.958	34.6	D	1205	1.196	*	F
EB R	398	0.788	26.5	D	229	0.469	18.1	C
WB L	326	1.806	*	F	328	1.816	*	F
WB T	1082	1.074	65.4	F	984	0.977	37.7	D
WB R	619	1.312	*	F	382	0.734	23.8	C
NB L	220	1.605	*	F	360	2.632	*	F
NB T	1209	2.823	*	F	506	1.181	*	F
NB R	81	0.224	18.5	C	192	0.538	21.7	C
SB L	187	1.421	*	F	639	4.850	*	F
SB T	506	1.173	*	F	1206	2.796	*	F
SB R	280	0.650	24.0	C	719	2.069	*	F
Overall:			*	F			*	F
Street Road and Second Street Pike (Location 5)								
EB L	76	0.469	18.2	C	176	0.923	48.7	E
EB TR	1024	0.975	39.2	D	1779	1.770	*	F
WB L	93	0.556	19.5	C	105	0.538	18.5	C
WB TR	1273	1.167	*	F	1268	1.200	*	F
NB L	479	2.674	*	F	297	1.215	*	F
NB TR	533	0.961	41.8	E	685	1.130	*	F
SB L	212	0.983	61.0	F	275	1.112	*	F
SB TR	579	0.900	33.1	D	714	1.207	*	F
Overall:			*	F			*	F
County Line Road and Blair Mill Road (Location 6)								
EB TR	1349	1.336	*	F	1233	1.219	*	F
WB L	489	0.994	48.8	E	481	1.225	*	F
WB T	825	0.419	5.7	B	1430	0.808	12.9	B
NB	463	1.208	*	F	690	1.282	*	F
Overall:			*	F			*	F

Table 4.4-3

Summary of LOS Analysis - Reuse Plan

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
County Line Road and Old York Road (Location 7)								
EB L	154	0.486	25.2	D	143	0.449	24.2	C
EB TR	1324	1.510	*	F	1093	1.172	*	F
WB L	320	1.116	*	F	544	1.814	*	F
WB TR	1037	1.252	*	F	1550	1.689	*	F
NB L	190	0.931	55.9	E	138	0.688	34.2	D
NB T	604	0.879	32.0	D	521	0.725	26.9	D
NB R	455	1.412	*	F	307	0.772	32.0	D
SB L	59	0.294	25.7	D	106	0.532	29.6	D
SB T	444	0.675	24.9	C	864	1.256	*	F
SB R	75	0.249	20.9	C	160	0.472	23.9	C
Overall: 95			*	F			*	F
County Line Road and Jacksonville Road (Location 8)								
EB L	586	7.875	*	F	142	2.031	*	F
EB TR	999	1.115	*		986	1.230	*	F
WB L	26	0.363	10.0	B	18	0.948	26.2	D
WB T	881	0.999	37.0		1078	0.948	26.2	D
WB R	593	0.676	12.8	D	270	0.308	9.8	B
NB L	54	1.333	*	F	90	1.375	*	F
NB TR	567	1.333	*	F	391	0.923	38.6	D
SB	837	1.030	51.3	E	1949	2.056	*	F
Overall:			*	F			*	F
Notes: NB-Northbound; SB-Southbound; EB-Eastbound; WB-Westbound L-Left turn; R-Right turn; T-Through;								

LOS F describes operations with delay in excess of sixty seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection (Transportation Research Board, 1994). The proposed Reuse Plan would require roadway improvements to mitigate this impact. The mitigation measures investigated and the effects of each are discussed in Chapter 5 (Mitigation Measures).

Public Transportation

Increased use of the existing public transit system would be expected under the proposed Reuse Plan. However, the existing system has residual capacity which is expected to accommodate additional loadings generated by the project.

4.4.3 Residential Alternative

The Residential Alternative would involve increased residential development and diminished industrial use. The trips generated by this alternative were developed using similar assumptions as for the Reuse Plan. Using these methodologies, Table 4.4-4 was developed. The Residential Alternative would generate additional trips to the site as follows: 2,188 additional peak hour trips (1,827-enter and 361-exit) would be generated during the am peak hours and 2,367 additional trips (428-enter and 1,939-exit) during the pm peak hours, compared to the no action alternative. The Residential Alternative would generate 18,051 total daily trips.

Comparison of Table 4.4-4 with Table 4.4-2 indicates that the Residential Alternative generates fewer vehicles than the Reuse Plan (i.e., 1,533 less than the Reuse Plan during the am peak hours and 1,398 less during the pm peak hours). Impacts of this alternative are less than the Reuse Plan, however, local street operations would remain constrained during the am and pm peak hours. Capacity analyses have been conducted for two locations to demonstrate the impacts. Table 4.4-5 presents the results of these analyses. Both locations would operate at LOS F (as with the Reuse Plan) during the peak hours with extensive delays to be expected.

4.4.4 Aviation Alternative

The trips generated by the Aviation Alternative were developed using similar assumptions as for the Reuse Plan. Using these methodologies, Table 4.4-6 was developed. The Aviation Alternative would generate trips to the site as follows: 4,001 additional peak hour trips (3,920-enter and 81-exit) would be generated during the am peak hours and 4,030 additional trips (122-enter and 3,908-exit) during the pm peak hours, compared to the no action alternative. The Aviation Alternative would generate 27,044 total daily trips.

Table 4.4-4
Generated Vehicle Trips
Residential Alternative

Land Use	Number of Employees	Number of Dwelling Units	Vehicle Trips Generated			
			AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Multi-Business	2515		1075	0	0	1075
Industrial/Business	1377		589	0	0	589
Residential		575	114	323	375	211
Park/Recreation	25		11	0	0	11
Congregate Care		500 beds	38	38	53	53
Total peak hour trips generated			1827	361	428	1939

Table 4.4-5

Summary of LOS Analysis - Residential Alternative

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
Street Road and Jacksonville Road (Location 4)								
EB L	536	2.941	*	F	185	1.016	83.3	F
EB T	965	0.958	34.6	D	1177	1.168	*	F
EB R	371	0.721	23.4	C	229	0.469	18.1	C
WB L	308	1.707	*	F	304	1.687	*	F
WB T	1065	1.057	59.0	E	960	0.953	33.9	D
WB R	510	1.047	68.9	F	419	0.826	28.7	D
NB L	220	1.605	*	F	360	2.632	*	F
NB T	820	1.915	*	F	550	1.284	*	F
NB R	54	0.144	18.1	C	164	0.455	20.5	C
SB L	161	1.223	*	F	540	4.098	*	F
SB T	542	1.256	*	F	827	1.918	*	F
SB R	254	0.572	22.3	C	538	1.534	*	F
Overall:			*	F			*	F
County Line Road and Old York Road (Location 7)								
EB L	122	0.385	24.1	C	139	0.437	24.0	C
EB TR	1180	1.346	*	F	1075	1.153	*	F
WB L	320	1.116	*	F	508	1.694	*	F
WB TR	993	1.200	*	F	1407	1.533	*	F
NB L	190	0.931	55.9	E	138	0.688	34.2	D
NB T	587	0.855	30.4	D	536	0.747	27.4	D
NB R	423	1.291	*	F	303	0.758	31.2	D
SB L	59	0.294	25.7	D	106	0.532	29.6	D
SB T	444	0.675	24.9	C	850	1.236	*	F
SB R	75	0.249	20.9	C	127	0.368	22.8	C
Overall:			*	F			*	F
Notes: NB-Northbound; SB-Southbound; EB-Eastbound; WB-Westbound L-Left turn; R-Right turn; T-Through;								

Table 4.4-6
Generated Vehicle Trips
Aviation Alternative

Land Use			Vehicle Trips Generated			
	Number of Employees	Number of Dwelling Units	AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Multi-Business	2400	100 beds	1025	0	0	1025
Industrial/Business	6465		2760	0	0	2760
Aviation	40		17	10	10	17
Hotel/Conference			108	71	112	96
Park/Recreation	20		10	0	0	10
Total peak hour trips generated			3920	81	122	3908

Comparison of Table 4.4-6 with Table 4.4-2, indicates that the Aviation Alternative generates slightly more vehicles (280 more than the Reuse Plan during the am peak hours and 204 more during the pm peak hours). Impacts of this alternative, therefore, would be more substantial. Capacity analyses have been conducted for two locations to demonstrate the impacts. Table 4.4-7 presents the results of these analyses. Both locations would operate at LOS F (as with the Reuse Plan and Residential Alternative) during the peak hours with extensive delays to be expected.

Table 4.4-7

Summary of LOS Analysis - Aviation Alternative

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
Street Road and Jacksonville Road (Location 4)								
EB L	781	4.283	*	F	152	0.834	45.7	E
EB T	984	0.977	37.7	D	1178	1.169	*	F
EB R	371	0.721	23.4	C	229	0.469	18.1	C
WB L	309	1.712	*	F	323	1.791	*	F
WB T	1066	1.058	59.3	E	979	0.972	36.8	D
WB R	652	1.391	*	F	363	0.688	22.3	C
NB L	220	1.605	*	F	360	2.632	*	F
NB T	1293	3.020	*	F	493	1.152	*	F
NB R	73	0.200	18.4	C	165	0.458	20.6	C
SB L	170	1.291	*	F	665	5.048	*	F
SB T	489	1.133	*	F	1274	2.955	*	F
SB R	269	0.618	23.2	C	766	2.207	*	F
Overall:			*	F			*	F
County Line Road and Old York Road (Location 7)								
EB L	163	0.513	25.5	D	143	0.449	24.2	C
EB TR	1353	1.543	*	F	1071	1.149	*	F
WB L	322	1.122	*	F	551	1.838	*	F
WB TR	1003	1.212	*	F	1575	1.717	*	F
NB L	190	0.931	55.9	E	138	0.688	34.2	D
NB T	612	0.890	32.8	D	521	0.725	26.9	D
NB R	464	1.445	*	F	307	0.772	32.0	D
SB L	59	0.294	25.7	D	106	0.532	29.6	D
SB T	446	0.678	24.9	C	871	1.266	*	F
SB R	77	0.255	20.9	C	167	0.495	24.2	C
Overall:			*	F			*	F
Notes: NB-Northbound; SB-Southbound; EB-Eastbound; WB-Westbound L-Left turn; R-Right turn; T-Through								

4.5 Air Quality

4.5.1 No Action Alternative

Mobile Sources

The purpose of this microscale air quality analysis is to evaluate the impacts of traffic-related carbon monoxide for the Reuse Plan and alternatives, including the no action alternative. Average hourly CO concentrations were predicted for the peak am and pm one-hour traffic periods using an air pollutant dispersion model. These concentrations were multiplied by a persistence factor of 0.7 to determine the eight-hour concentrations. Background CO concentrations (Subchapter 3.5.2) were added to the traffic-related concentrations predicted from the model to obtain a total CO impact level.

This analysis used the same receptors used in the study of existing conditions. The results of the microscale air quality analysis for the no action alternative show no violations of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of 9 ppm (Tables 4.5-1 and 4.5-2) for both the am and pm peak periods. The results indicate CO levels less than those under existing conditions due to a decrease in per vehicle emissions resulting from compliance with the Federal Vehicle Emission Control Program.

Stationary Sources

Under the no action alternative, only the six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex to be transferred to NASJRBWG would continue to be occupied. Stationary source emissions would therefore, decrease substantially.

4.5.2 Reuse Plan

Mobile Sources

As described in Subchapters 2.3.3 and 4.4, approximately 84 acres (34 hectares) of the site were originally anticipated for educational/institutional use. However, based on discussions with the FLRA, a more likely scenario would be industrial development. Therefore, this air analysis has assumed the industrial option as a conservative scenario.

Utilizing the same modeling assumptions described in Subchapter 4.5.1, the results of the microscale air quality analysis for the Reuse Plan Alternative show no violations of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of 9 ppm (Tables 4.5-1 and 4.5-2). While CO levels would be higher under the Reuse Plan than the future no action baseline at all locations due to increased traffic, the increases are not significant.

Table 4.5-1

Comparison of Worst Case Projected AM Peak CO Levels
for No Action Alternative and Reuse Plan (Year 2010)

Location	One-Hour Concentration (ppm)		Eight-Hour Concentration (ppm)	
	No Action Alternative	Reuse Plan Alternative	No Action Alternative	Reuse Plan Alternative
Jacksonville Road/Bristol Road	6.9	7.4	4.6	5.0
Bristol Road/Hatboro Road	6.0	6.3	4.0	4.2
Street Road/Old York Road	9.7	10.3	6.6	7.0
Jacksonville Road/Street Road	8.6	9.8	5.8	6.7
Street Road/Second Street Pike	7.7	8.3	5.2	5.6
County Line Road/Blair Mill Road	8.4	9.5	5.7	6.5
County Line Road/Old York Road	9.3	9.6	6.3	6.5
Jacksonville Road/County Line Road	7.9	8.5	5.3	5.8
Notes: CO levels include background concentrations of 5.0 ppm (one-hour) and 3.3 ppm (eight-hour). Pennsylvania standard is 35 ppm for 1-hour and 9 ppm for 8-hour averaging periods				

Table 4.5-2

Comparison of Worst Case Projected PM Peak CO Levels
for No Action Alternative and Reuse Plan (Year 2010)

Location	One-Hour Concentration (ppm)		Eight-Hour Concentration (ppm)	
	No Action Alternative	Reuse Plan Alternative	No Action Alternative	Reuse Plan Alternative
Jacksonville Road/Bristol Road	7.1	7.6	4.8	5.1
Bristol Road/Hatboro Road	6.0	6.5	4.0	4.4
Street Road/Old York Road	10.3	10.3	7.0	7.0
Jacksonville Road/Street Road	9.0	10.5	6.1	7.2
Street Road/Second Street Pike	8.3	8.6	5.6	5.8
County Line Road/Blair Mill Road	8.3	8.5	5.6	5.8
County Line Road/Old York Road	9.3	10.0	6.3	6.8
Jacksonville Road/County Line Road	8.0	8.4	5.4	5.7
Notes: CO levels include background concentrations of 5.0 ppm (one-hour) and 3.3 ppm (eight-hour). Pennsylvania standard is 35 ppm for 1-hour and 9 ppm for 8-hour averaging periods.				

Stationary Sources

The long term impact on air quality that would arise from stationary emission sources, including heating units, would depend upon the nature and extent of the activities conducted on the property under the proposed Reuse Plan. The Pennsylvania Department of Environmental Protection will have jurisdiction over these emission sources, and it will be necessary for all such sources to comply with agency standards. Certain sources will require appropriate permits from the Pennsylvania Department of Environmental Protection.

Construction Impacts

The major air quality concerns during construction and demolition are fugitive dust from on-site construction activities and mobile source emissions from construction vehicles and equipment and the motor vehicles of construction workers.

Preventive measures such as the use of water to control dust during demolition and construction operations would sufficiently minimize significant airborne particulate release. Additionally, periodic sweeping and wetting of dirt or gravel paths, roadways, material stockpiles, and other surfaces may be necessary.

Mobile source emissions would be generated from construction vehicles and equipment and the motor vehicles of construction workers. However, these effects would not be significant and would be short-term in nature.

Clean Air Act Conformity

As discussed in Subchapter 3.5, the general conformity rules are not applicable to the proposed reuse alternatives of the former NAWCAD under exemption XIX as stated in 40 CFR Part 153(c). A record of nonapplicability is included in Appendix C.

4.5.3 Residential Alternative

Mobile Sources

The CO modeling results for two representative intersections that would be affected by implementation of the proposed Residential Alternative are shown in Table 4.5-3. The locations modeled were the Street Road and Jacksonville Road intersection and the County Line Road and York Road intersection. The table shows that CO levels would be higher under the Residential Alternative than the future no action alternative due to increased traffic. However, there would be no violations of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of 9 ppm.

Table 4.5-3

Comparison of Worst Case Projected CO Levels
for No Action and Residential Alternatives (Year 2010)

Receptor	One-Hour Concentration (ppm)		Eight-Hour Concentration (ppm)	
	No Action Alternative	Residential Alternative	No Action Alternative	Residential Alternative
Street Road and Jacksonville Road	9.0	10.0	6.1	6.8
County Line Road and York Road	9.3	10.0	6.3	6.8
Notes: Levels include background concentrations of 5.0 ppm (1-hour) and 3.3 ppm (8-hour). Pennsylvania standard is 35 ppm for 1-hour and 9 ppm for 8-hour averaging periods.				

Stationary Sources

As discussed for the proposed Reuse Plan, the long term impact on air quality that would arise from stationary emission sources, including heating units, would depend upon the nature and extent of the activities conducted on the property. The Pennsylvania Department of Environmental Protection will have jurisdiction over these emission sources, and it will be necessary for all such sources to comply with agency standards. Certain sources will require appropriate permits from the Pennsylvania Department of Environmental Protection.

4.5.4 Aviation Alternative

Mobile Sources

The CO modeling results for two representative intersections that would be affected by implementation of the proposed Aviation Alternative are shown in Table 4.5-4. The locations modeled were the Street Road and Jacksonville Road intersection and the County Line Road and York Road intersection. The table shows that CO levels would be higher under the Aviation Alternative than the future no action alternative due to increased traffic. However, there would be no exceedances of the NAAQS CO one-hour standard of 35 ppm and eight-hour standard of 9 ppm.

Table 4.5-4

Comparison of Worst Case Projected Carbon Monoxide Levels
for No Action and Aviation Alternatives (Year 2010)

Receptor	One-Hour Concentration (ppm)		Eight-Hour Concentration (ppm)	
	No Action Alternative	Aviation Alternative	No Action Alternative	Aviation Alternative
Street Road and Jacksonville Road	9.0	10.6	6.1	7.2
County Line Road and York Road	9.3	10.0	6.3	6.8
Notes: Levels include background concentrations of 5.0 ppm (1-hour) and 3.3 ppm (8-hour). Pennsylvania standard is 35 ppm for 1-hour and 9 ppm for 8-hour averaging periods.				

Stationary Sources

As described for the Reuse Plan and Residential Alternatives, the long term impact on air quality that would arise from stationary emission sources, including heating units, would depend upon the nature and extent of the activities conducted on the property under the Aviation Alternative. The Pennsylvania Department of Environmental Protection will have jurisdiction over these emission sources, and it will be necessary for all such sources to comply with agency standards. Certain sources will require appropriate permits from the Pennsylvania Department of Environmental Protection.

4.6 Noise

Human response to changes in noise levels depends on many factors, including the quality of sound, the magnitude of the change, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely with the individual, as does response to the perceived changes. However, the average ability of an individual to perceive changes in noise levels is well documented (Table 4.6-1).

Table 4.6-1

Average Ability to Perceive Changes in Noise Levels

Change (dBA)	Human Perception of Sound
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound
Source: Bolt, Beranek and Neuman, Inc., June 1973.	

Generally, a 3 dBA or smaller change in noise levels would be barely perceptible to most listeners, whereas, a 10 dBA change is normally perceived as a doubling (or halving) of noise levels. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

4.6.1 No Action Alternative

Mobile Sources

The methodology for predicting future noise levels is based on the assumption that existing noise levels are dominated by, and are a function of, existing traffic volumes, and that future noise levels can be determined based on the proportional increase in traffic (on a logarithmic basis) associated with a project. For example, if the existing volume on a street is 100 vehicles per hour, and if the future traffic is increased by 50 vehicles per hour for a total of 150 vehicles per hour, the noise levels would increase by approximately 1.8 decibels. If future traffic is increased by 100 vehicles per hour to a total of 200 vehicles per hour, noise levels would increase by three decibels; in other words a doubling of traffic volume corresponds to a 3 decibel increase in noise level.

Future predicted (baseline) noise levels for the Reuse Plan in the year 2010 are presented in Table 4.6-2. The computations are based on the traffic analyses presented in Subchapter 4.4. All increases in noise levels from existing conditions to future no action conditions (assuming base reuse does not occur) are less than or equal to one decibel (zero values for net change represent increases of less than one half decibel).

4.6.2 Reuse Plan Alternative

Mobile Sources

Changes in noise levels due to implementation of the Reuse Plan were determined by adding the noise attributable to development-generated traffic to noise levels previously calculated for the future no action alternative. Table 4.6-2 presents the results of the am peak, midday peak, pm peak, pre-midnight, 24-hour L_{eq} and L_{dn} analysis, as well as, specific hours of the day where there was a 3 dBA or greater change at specific sites (a 3 dBA or greater change in noise levels becomes perceptible to most listeners). The hourly L_{eq} analysis shows that with the exception of a few hours of the day, noise levels would increase less than or equal to one decibel from the no action to the Reuse Plan alternative. Noise increases equal to or greater than 3 dBA are noted below:

- Site 2 (on Bristol Road, east of Hatsboro Road) - would experience increases in noise levels of three decibels between 5 am and 6 am.
- Site 3 (on Bristol Road, west of Hatsboro Road) - would experience increases in noise levels of five decibels between 5 am and 6 am and three decibels between 6 am and 7 am.
- Site 4 (on Jacksonville Road) - would experience increases in noise levels of five decibels between 5 am and 6 am and three decibels between 6 am and 7 am.
- Site 6 (east of Davisville Road) - would experience increases in noise levels of four decibels between 5 am and 6 am and three decibels between 6 am and 7 am.

At Sites 2, 3, 4, and 6, noise increases would be noticeable in the early morning hours. However, the noise measurement program established that existing noise levels near the residential receptors studied are already high and typical of a suburban neighborhood. In some cases, ambient noise levels

Table 4.6-2

Predicted Noise Levels for No Action and Reuse Plan Alternatives

Site	Hour	Noise Level (L_{eq} in dBA)		
		No Action	Reuse Plan	Net Change
1	AM Peak (8-9 am)	66	66	0
	Midday Peak (12 -1 pm)	65	65	0
	PM Peak (5-6 pm)	66	66	0
	Pre midnight (9-10 pm)	62	62	0
	No hours with net change of ≥ 3 dBA			
	24-Hour L_{eq} L_{dn}	63 66	63 66	0 0
2	AM Peak	65	66	1
	Midday Peak	64	64	0
	PM Peak	65	65	0
	Pre midnight	59	59	0
	5 am - 6 am	53	56	3
3	24-Hour L_{eq} L_{dn}	62 65	63 65	1 0
	AM Peak	64	65	1
	Midday Peak	64	66	2
	PM Peak	65	66	1
	Pre midnight	63	63	0
	5 am - 6 am 6 am - 7 am	57 61	62 64	5 3
	24-Hour L_{eq} L_{dn}	63 66	64 67	1 1

Table 4.6-2

Predicted Noise Levels for No Action and Reuse Plan Alternatives

Site	Hour	Noise Level (L_{eq} in dBA)		
		No Action	Reuse Plan	Net Change
4	AM Peak	64	65	1
	Midday Peak	64	66	2
	PM Peak	66	67	1
	Pre midnight	64	64	0
	5 am - 6 am	58	63	5
	6 am - 7 am	62	65	3
	24-Hour L_{eq} L_{dn}	63 66	64 68	1 2
5	AM Peak	67	67	0
	Midday Peak	66	66	1
	PM Peak	69	69	0
	Pre midnight	65	65	0
	No hours with net change of ≥ 3 dBA			
	24-Hour L_{eq} L_{dn}	65 68	65 68	0 0
6	AM Peak	67	68	1
	Midday Peak	65	66	1
	PM Peak	68	69	1
	Pre midnight	64	64	0
	5 am - 6 am	58	62	4
	6 am - 7 am	64	67	3
	24-Hour L_{eq} L_{dn}	65 68	65 69	0 1

exceed some criteria. Overall future noise impacts of the Reuse Plan can be summarized as follows (Table 4.6-2):

- Federal Highway Administration (23 CFR 772) - The FHWA criterion for residential land use, schools, parks, and recreation is 67 dBA. Predicted noise levels at Sites 4, 5, and 6 exceed these criteria for some hours of the day and night. At Sites 5 and 6 the criterion is exceeded for the same hours as under existing conditions;
- HUD Environmental Criteria and Standards - The HUD "Acceptable" criterion for housing is an L_{dn} of 65 dBA. The increase in L_{dn} noise level from the no action alternative to future implementation of the Reuse Plan would be less than or equal to one decibel at Sites 1 and 5. At Sites 1, 4, 5, and 6 the acceptable noise zone criteria would be exceeded under the Reuse Plan condition as it is for the no action condition. At Site 2, the acceptable noise zone criterion would be exceeded under the Reuse Plan condition, but not exceeded under the no action condition.

Stationary Sources

Any exterior mechanical equipment (e.g., fans, compressors) would be designed to comply with all local and state noise ordinances. As a result, noise levels from such mechanical equipment at the site under the Reuse Plan would not be significant.

Construction Impacts

Impacts on community noise levels during construction activities associated with the Reuse Plan components would include noise from construction equipment operating at the site and construction vehicles/delivery vehicles traveling to and from the site. Noise impacts would also vary widely, depending on the phase of construction - demolition, land clearing and excavations, foundation and capping, erection of structural steel, construction of exterior walls, etc.--and the specific task being undertaken. Increased noise levels would be most significant during the early stages of each construction phase, although these periods would be of relatively short duration. In any event, the noise generated would be similar to noise generated by other local construction projects and all phases of construction would comply with the restrictions specified in local noise ordinances.

Noise levels at a given receptor location would depend on the type and number of pieces of construction equipment being operated and the distance from the construction-site. Typical noise levels for construction equipment are shown in Table 4.6-3.

In addition, small increases in noise levels would be expected as a result of the operation of delivery trucks and other construction vehicles. These increases would be expected mainly along a few defined truck routes and close to the development site, but would not be significant.

Table 4.6-3

Typical Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Air Compressor	81
Asphalt Spreader (paver)	89
Asphalt truck	88
Backhoe	85
Bulldozer	87
Compactor	80
Concrete Plant	83
Concrete Spreader	89
Concrete Mixer	85
Concrete Vibrator	76
Crane (derrick)	88
Delivery Truck	88
Diamond Saw	90
Dredge	88
Dump Truck	88
Front End Loader	84
Gas-Driven Vibro-compactor	76
Hoist	76
Jackhammer (Paving Breaker)	88
Line Drill	98
Motor Crane	83
Pile Driver/Extractor	101
Pump	76
Roller	80
Shovel	82
Truck	88
Tug	85
Vibratory Pile Driver/Extractor	89
Source: Patterson, et al., 1974.	

4.6.3 Residential Alternative

In general, future mobile source noise impacts associated with the Residential Alternative would be less than those of the Reuse Plan, given the comparable level of trip generation. Stationary source impacts and construction noise impacts under this alternative would also be similar to those previously described for the Reuse Plan.

4.6.4 Aviation Alternative

Aircraft

Aircraft noise levels are typically expressed in terms of decibels (dB). Decibels are a logarithmic expression of sound energy. Frequency weightings have been developed to more closely duplicate the human hearing response. A-weighted decibels, or dBA, is the weighting network most often applied to aircraft noise evaluation. A variety of noise metrics based on dB and dBA have been developed. Two types of metrics are typically used: single-event metrics and cumulative metrics.

The single-event metrics describe individual aircraft events. Two types of single-event energy metrics include:

- EPNL - Effective Perceived Noise Level; and
- SEL - Sound Exposure Level.

The cumulative metrics describe average noise levels over a period of time. Several cumulative metrics derived from EPNL or SEL are available to describe aircraft noise. Of these, the Day-Night Average Sound Level (DNL) is currently the officially accepted metric of the Federal Aviation Administration (FAA).

In June 1980, a Federal Interagency Committee (FIC) on Urban Noise published guidelines (FIC, June 1980) relating DNL to compatible land uses. This committee was composed of representatives from the DoD, Transportation, and Housing and Urban Development; the Environmental Protection Agency; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, the DoD and the FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations. Although these guidelines are not mandatory, they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor DNL above 65 dB, and the extent of land areas

and populations exposed to DNL of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions.

In 1990 a new FIC on Noise was formed to review the manner in which aviation noise effects are assessed and presented. This group released its report in 1992 and reaffirmed the use of DNL as the best metric for this purpose (FIC, August 1992).

The DNL is the average of aircraft sound levels at a location over a complete 24-hour period, with a 10-decibel adjustment added to those noise events which take place between 10:00 p.m. and 7:00 am (local time) the following morning. This 10-decibel "penalty" represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours. For this environmental study, levels of DNL equal to and greater than 65 dB were used for assessing community noise impact.

The aircraft operations under aviation alternative were developed based on the potential interest on the general aviation activities in the vicinity of Warminster area. A forecast of general aviation activity was prepared employing 1994 as the base year, 2000 as the short-term projection and 2010 as the planning horizon. These forecasts were developed for general aviation and for light air cargo/freight operations. Three ranges of projected based aircraft and resultant operational forecasts were developed as follows:

- High-Range: equal to 100 percent of registered aircraft owners in zip codes within a 30-minute average travel time from the site;
- Mid-Range: equal to 40 percent of the registered aircraft. This is the average percentage of the registered aircraft within the market areas of two nearby airports (Doylestown and Wings Field) that are actually based at these airports;
- Low-Range: equal to 24 percent of the registered aircraft. This is similar to the average percentage of the registered aircraft within the market area of Buehl Field actually based there.

For modeling purposes, the mid-range forecasts that represent the reasonable worst case operation scenario were used. The detailed methodology and assumptions used to derive the forecast can be found in Appendix B. Assumptions used for the following noise analysis are in Appendix E.

The FAA preferred computer model, Integrated Noise Model (INM, version 5.0), was utilized to predict the noise impact from the forecasted mid-range aircraft operations. INM was developed by the Federal Aviation Administration (FAA) as a planning tool for determining approximate aircraft noise levels at and around airport. The model incorporates a database of known sound levels from various aircraft and uses mathematical processes which consider the degradation of sound energy over distance.

The average daily aircraft operations forecasted for mid-range scenario and the type of the aircraft used in INM model are presented in Table 4.6-4. This table indicates that 45,900 annual aircraft operations are forecast for the day, and 600 for the night for a total of 46,500. Figure 4.6-1 (Possible Flight Tracks for Aviation Alternative) presents the flight tracks configuration. The DNL 55 dB through 85 dB contours (Figure 4.6-2, Average Daily DNL Contours for Aviation Alternative) indicate that the noise impact of the Aviation Alternative would not be significant due to the type of aircraft and the light aircraft traffic predicted. Table 4.6-5 shows the impact of aircraft operations in terms of land acreage affected by the noise levels that are equal to or higher than 65 dB. The affected areas would be within the runway's clear zones; therefore, no significant noise impact was predicted from the Aviation Alternative.

Historic noise levels at NAWCAD were reviewed for comparative purposes with the proposed Aviation Alternative. Contours above 60 dB for 1988 operations at the NAWCAD airfield were reported (Harris Miller Miller & Hanson Inc., 1989). These contours are shown in Figure 4.6-3 (1988 DNL at NAWCAD Warminster). The noise impact from the Aviation Alternative would be significantly less than what occurred in 1988. The difference is attributable to the different type of aircraft operations. The noise level from general aviation aircraft would be low compared with military aircraft such as T-2 and A-7 jet aircraft.

Ground Vehicles

With respect to ground vehicles, the Aviation Alternative would generate higher traffic volumes than the other alternatives. As a result, it would be expected that noise levels generated would also be higher than for the other alternatives. Stationary source impacts and construction noise impacts would be similar to those previously described for the Reuse Plan Alternative.

Table 4.6-4

Forecast Annual Aircraft Operations and INM Model Type

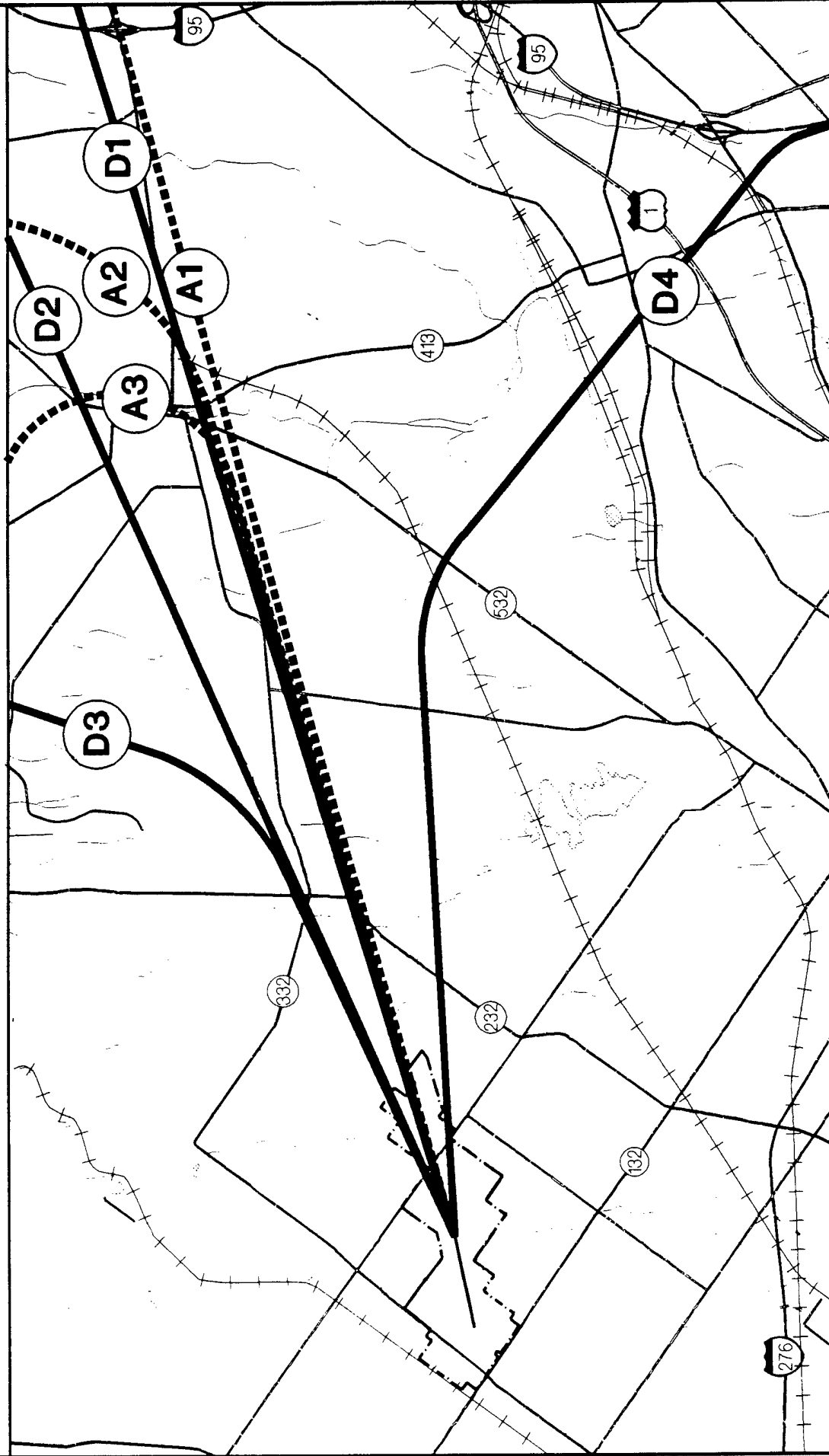
Aircraft Type	INM Model Type	Mid-Range		
		Total	Day	Night
Single Engine Piston (SEP) - CNA177	GASEPF	42,900	42,450	450
Multi Engine Piston (MEP) - BEC58P	BEC58P	3,000	2,950	50
Turboprop (TUR) - CNA441	CNA441	600	500	100
TOTAL		46,500	45,900	600

Table 4.6-5

Areas Within Noise Exposure Contours at NAWCAD

DNL Contour	Acres (Hectares)
65	19 (8)
70	6 (2)
75	0
80	0
85	0
Note: All contours are within the NAWCAD boundary	

Possible Flight Tracks for Aviation Alternative



--- NAWCAD Property Boundary

... Arrival Track

— Departure Track

Source: USGS, 1983.

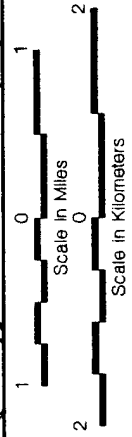
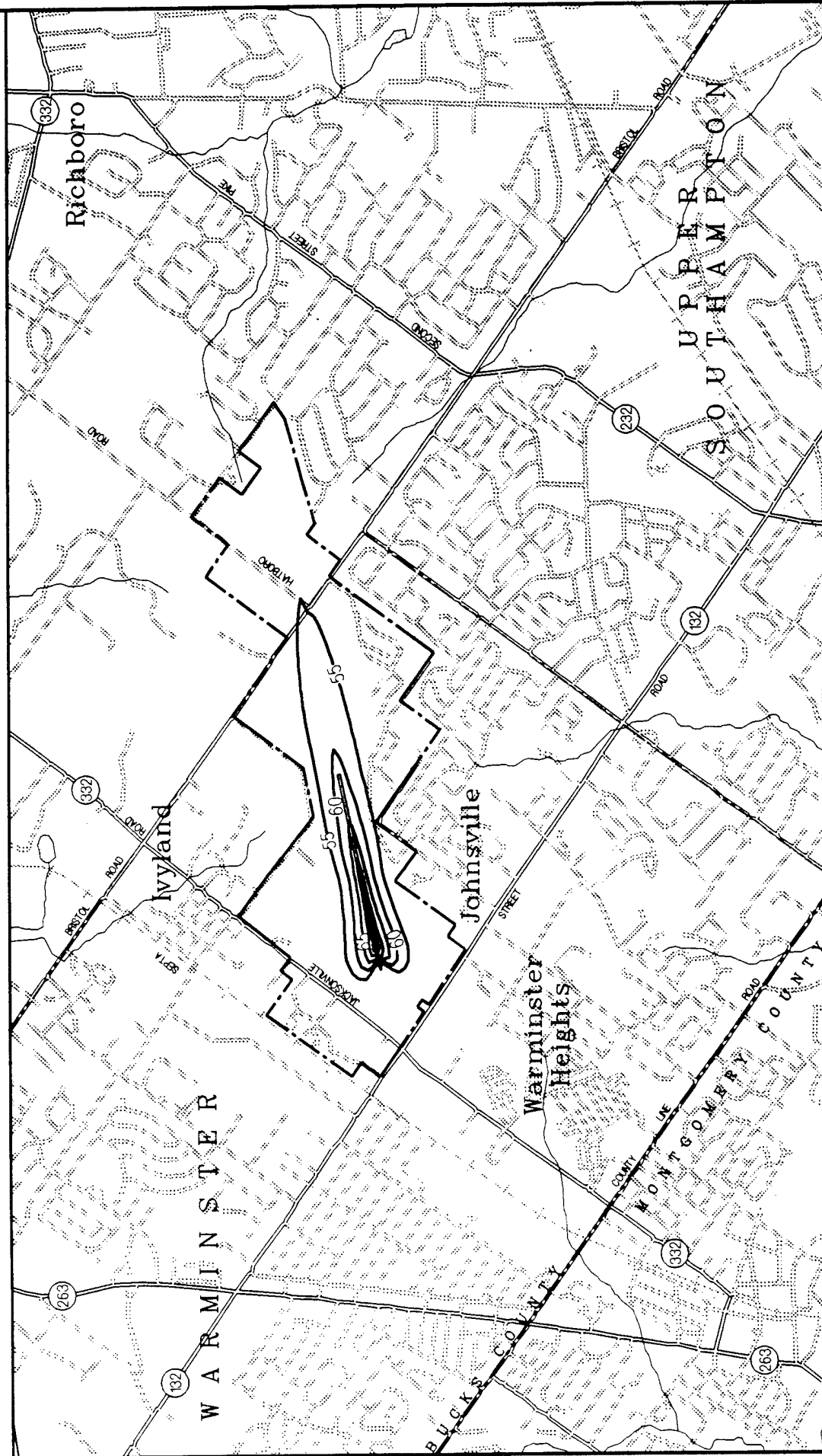


Figure 4.6-1

Average Daily DNL Contours for Aviation Alternative



—60— Noise Contour (DNL)

--- NAWCAD Property Boundary

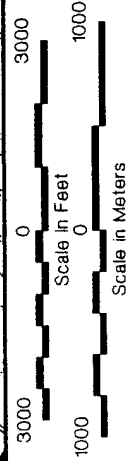
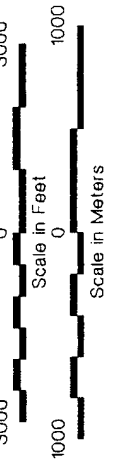
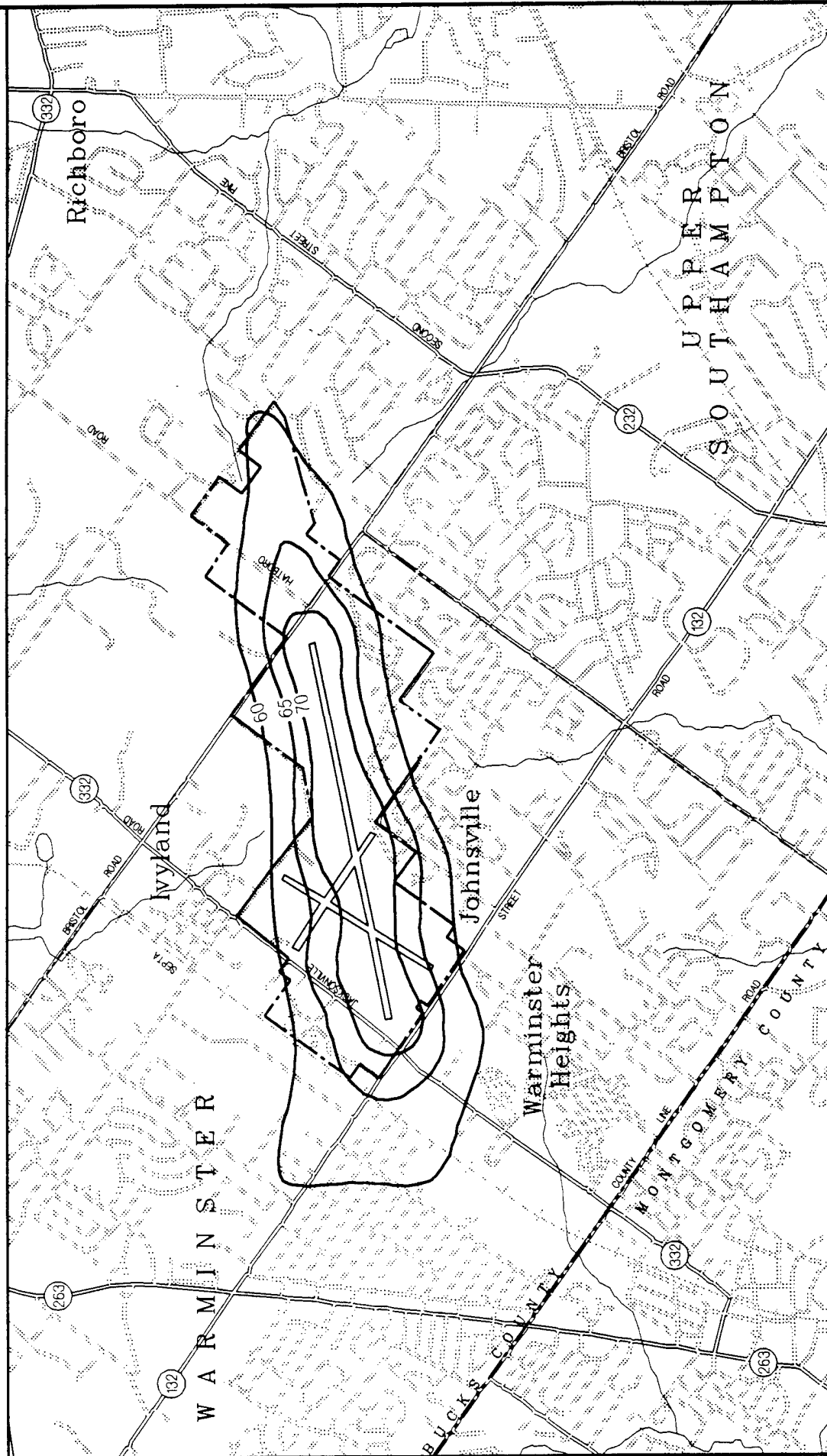


Figure 4.6-2

1988 DNL at NAWCAD Warminster



- 60— Noise Contour (DNL)
- - - NAWCAD Property Boundary

Figure 4.6-3



4.7 Infrastructure

4.7.1 No Action Alternative

Under the no action alternative there would be no redevelopment at the base. There would thus be little or no new demand created for utilities under the no action alternative. The six officer family housing units on Jacksonville Road and the 199-unit enlisted family housing complex to be transferred to NASJRBWG would continued to be occupied by the Navy. It is assumed that local municipalities would provide utility services to this housing. These conditions describe the baseline condition assumed for the no action alternative.

4.7.2 Reuse Plan

Electricity

Electrical service to NAWCAD is currently, and would continue to, be provided by PECO Energy. According to the Reuse Plan (ERA, 1995), a study was initiated to investigate methods of converting the electrical distribution system from a radial system to a loop primary system to add redundancy and emergency power. Additional study would be required to address the gradual replacement and upgrade of the distribution system in accordance with the phased implementation of the Reuse Plan (ERA, 1995). Given the scope and flexibility of the proposed Reuse Plan, actual future industrial tenants cannot be predicted at this time, and therefore, their actual demands on the electrical system cannot be predicted.

Steam Production

The steam supply currently consists of one distribution system that is fed from a central plant in Bldg 1. The central steam plant capacity of 97,000 lbs per hour (44,000 kg per hour) is provided by three boilers. Steam would continue to be supplied to the Bldg 1, 2, 3 complex and other existing buildings to be utilized as per the Reuse Plan. It is anticipated that there would be ample steam available for future heating and industrial use.

Water Supply

NAWCAD currently purchases potable water from the Warminster Municipal Authority to serve the married enlisted housing area and the Inertial Guidance Facility at Bldg 108. All other water needs are currently supplied from existing wells on NAWCAD property.

Per capita water usage is estimated to be approximately 35 gallons (133 liters) per day. Water usage by roughly 7,600 persons under the proposed Reuse Plan would therefore be approximately 266,000

gallons (one million liters) per day. This demand would exceed historic usage of up to 5,000 personnel utilizing roughly 175,000 gallons (662,000 liters) per day of potable water at NAWCAD.

According to the Reuse Plan (ERA, 1995), there have been discussions with respect to the proposed Reuse Plan about how some of the existing wells at NAWCAD might be incorporated into the adjacent municipal authority systems. It was noted that a great deal of additional study would be required for such consideration (ERA, 1995). Potential sources of additional potable water for the proposed Reuse Plan were identified as the Northampton Municipal Authority and the Warminster Municipal Authority systems (ERA, 1995). Northampton and Warminster Townships both have water distribution lines in the vicinity of NAWCAD. Warminster Municipal Authority has indicated that an extension to an existing water line would be required to strengthen the distribution system, and that the estimated cost of providing that extension would be approximately \$500,000. The Warminster System could then supply 0.5 to 1.0 million gallons (two to four million liters) per day (ERA, 1995), which would provide an adequate source of potable water under the proposed Reuse Plan.

Wastewater System

NAWCAD currently discharges approximately 20,000 gallons (76,000 liters) per day to the Warminster Wastewater Treatment Plant. The plant presently has two million gallons (7.6 million liters) per day of available capacity, of which, approximately 1.5 million gallons (5.7 million liters) per day is allocated to future development (ERA, 1995). A representative of the Warminster Municipal Authority has expressed interest in providing service for the proposed Reuse Plan (ERA, 1995).

Per capita sanitary flow is estimated to be approximately 35 gallons (133 liters) per day, and future sanitary flow from 7,600 persons would therefore be approximately 266,000 gallons (one million liters) per day, which is within the amount of available capacity at the Warminster Wastewater Treatment Plant. Should a new line be required to convey wastewater from the site to the treatment plant, approximately 17,500 lineal ft (5,330 lineal m) of 12-inch (30-cm) gravity sewer could be installed for an order of magnitude cost estimate of \$1.4 million. Additional study of line capacity would be required at later stages of Reuse Plan implementation (ERA, 1995).

Historically, industrial wastes generated at NAWCAD were pre-treated in a two-stage treatment system consisting of three batch-operated 45,000-gallon (170,325-liter) holding/treatment tanks. Presently, there are no industrial wastes discharged to these facilities (ERA, 1995). Future industrial development under the proposed Reuse Plan may result in individual facilities that would require industrial discharges. Industrial discharges into publicly-owned treatment plants do not require a NPDES permit but are subject to USEPA's general pretreatment standards as implemented by Warminster. These standards include general pretreatment regulations and specific pretreatment standards covering specific industrial categories for new and existing facilities, and apply to pollutants from industrial sources that interfere with or pass untreated through a publicly-owned treatment

works. Pretreatment standards are similar to the limitations imposed on direct discharges from industrial sources into surface waters. The PA Department of Environmental Protection's Bureau of Water Quality Management (WQM) regulates discharges to meet NPDES requirements.

Stormwater

Construction activities associated with development of the Reuse Plan would be subject to the NPDES permit program. Stormwater pollution prevention plans, including elements addressing sedimentation basins would need to be prepared prior to a formal approval for permit coverage. The permit would need to include applicable components of the local sediment and erosion control site plan standards, site permits, and stormwater management site plans.

Presently, there are about 200 acres (81 hectares) of impervious surface on the 824-acre (334-hectare) site. Full build out of the Reuse Plan would result in a total of approximately 540 acres (220 hectares) of paved land. It is therefore estimated that the potential increase in impervious surfaces would be about 340 acres (138 hectares) under the Reuse Plan.

Solid Waste

Solid waste generated by NAWCAD is currently disposed of off-site by a private contractor, who is responsible for disposal method and location, and for adhering to all federal, state, and local regulations.

A typical per capita solid waste generation rate for residential and commercial use (excluding special [i.e., bulky items, consumer electronics, white goods, yard wastes, batteries, oils and tires] and hazardous wastes) is 3.8 lbs (1.7 kg) per day (Tchobanoglous, Theisen and Vigil, 1993). Per capita solid waste generation by approximately 7,600 people under the proposed Reuse Plan would therefore result in the generation of approximately 15 tons (13 metric tons) of solid waste per day. This would exceed historical per capita generation of solid waste at NAWCAD of roughly 10 tons (9 metric tons) per day from up to 5,000 people.

Despite the increase in solid waste generation, it is anticipated that implementation of the proposed Reuse Plan would have no significant adverse effect. Disposal of solid waste under the proposed Reuse Plan would continue to follow federal and state regulations, and would be in compliance with the *Bucks County Municipal Waste Management Plan*. This plan calls for a 40 percent reduction of the solid waste stream (through source reduction and recycling), along with the use of environmentally sound processing, disposal methods, and technologies. According to the plan, landfills will remain, overall, a key part of the county's integrated waste management program for the foreseeable future (Bucks County Planning Commission, 1993).

Other Utilities

Natural gas would continue to be provided by PECO Energy. Existing telephone lines would be available under the proposed Reuse Plan. No significant impacts to these utility systems would be anticipated with implementation of the Reuse Plan.

4.7.3 Residential Alternative

Electricity

PECO Energy would provide electrical service to the approximately 575 dwelling units under the proposed Residential Alternative, as well as to the facilities described in Subchapter 2.5.2. As with the proposed Reuse Plan, additional study would be required to address the gradual replacement and upgrade of the distribution system in accordance with the phased implementation of the Residential Alternative.

Steam Production

Steam would continue to be supplied to the non-residential facilities proposed in the Residential Alternative, and it is anticipated that there would be ample steam available for future heating and industrial use.

Potable Water

Per capita water usage is estimated to be approximately 100 gallons (379 liters) per day for residential use and 35 gallons per day (132 liters) for industrial use. Implementation of the Residential Alternative would result in approximately 1,600 residents and 5,000 personnel. Per capita water usage is therefore estimated to be about 335,000 gallons (1.3 million liters) per day, which would exceed historical demand at NAWCAD. Potential sources of additional potable water for the Residential Alternative would be the same as those identified for the proposed Reuse Plan.

Wastewater System

Per capita sanitary flow is estimated to be 100 gallons (379 liters) per day for residential use and 35 gallons per day (132 liters) for industrial use. Implementation of the Residential Alternative would result in approximately 1,600 residents and 5,000 personnel. Per capita sanitary flow is therefore estimated to be about 335,000 gallons (1.3 million liters) per day, which is within the amount of available capacity at the Warminster Wastewater Treatment Plant.

Stormwater

As previously described for the proposed Reuse Plan, construction activities associated with development of the Residential Alternative would be subject to the NPDES permit program. Stormwater pollution prevention plans, including elements addressing sedimentation basins would need to be prepared prior to a formal approval for permit coverage. The permit would need to include applicable components of the local sediment and erosion control site plan standards, site permits, and stormwater management site plans.

Presently, there are about 200 acres (81 hectares) of impervious surface on the 824-acre (334-hectare) site. Full build out of the Residential Alternative would result in a total of approximately 410 acres (166 hectares) of paved land. It is therefore estimated that the potential increase in impervious surfaces would be about 210 acres (85 hectares) under the Residential Alternative.

Solid Waste

As mentioned for the proposed Reuse Plan, a typical per capita solid waste generation rate for residential and commercial use is 3.8 pounds (1.7 kilograms) per day (Tchobanoglous, Theisen and Vigil, 1993). Per capita solid waste generation by approximately 6,600 people under the proposed Residential Alternative would therefore result in the generation of approximately 12.5 tons (11 metric tons) of solid waste per day. This would exceed historical per capita generation of solid waste at NAWCAD of roughly 10 tons (9 metric tons) per day from up to 5,000 people. As with the proposed Reuse Plan, despite the increase in solid waste generation, it is anticipated that implementation of the Residential Alternative would have no significant adverse effect. Disposal of solid waste would continue to follow federal and state regulations, and would be in compliance with the *Bucks County Municipal Waste Management Plan*.

Other Utilities

Natural gas would continue to be provided by PECO Energy. Existing telephone lines would be available under the Residential Alternative. No significant impacts to these utilities would be expected.

4.7.4 Aviation Alternative

Electricity

PECO Energy would continue to provide electrical service under the Aviation Alternative. As with the proposed Reuse Plan and Residential Alternatives, additional study would be required to address

the gradual replacement and upgrade of the distribution system in accordance with the phased implementation of the Aviation Alternative.

Steam Production

Steam would continue to be supplied to the facilities proposed in the Aviation Alternative, and it is anticipated that there would be ample steam available for future heating and industrial use.

Water Supply

Per capita water usage is estimated to be approximately 35 gallons per day (132 liters) for industrial use. Implementation of the Aviation Alternative would result in approximately 9,000 personnel. Per capita water usage is therefore estimated to be about 315,000 gallons (1.2 million liters) per day, which would exceed historical demand at NAWCAD. Potential sources of additional potable water for the Residential Alternative would be the same as those identified for the proposed Reuse Plan and Residential Alternatives.

Wastewater System

Per capita sanitary flow is estimated to be 35 gallons per day (132 liters) for industrial use. Implementation of the Aviation Alternative would result in approximately 9,000 personnel. Per capita sanitary flow is therefore estimated to be about 315,000 gallons (1.2 million liters) per day, which is within the amount of available capacity at the Warminster Wastewater Treatment Plant.

Stormwater

As mentioned for the Reuse Plan and Residential Alternative, construction activities associated with development of the Aviation Alternative would be subject to the NPDES permit program. Stormwater pollution prevention plans, including elements addressing sedimentation basins would need to be prepared prior to a formal approval for permit coverage. The permit would need to include applicable components of the local sediment and erosion control site plan standards, site permits, and stormwater management site plans.

Presently, there are about 200 acres (81 hectares) of impervious surface on the 824-acre (334-hectare) site. Full build out of the Aviation Alternative would result in a total of approximately 670 acres (271 hectares) of paved land. It is therefore estimated that the potential increase in impervious surfaces would be about 470 acres (190 hectares) under the Aviation Alternative.

Solid Waste

As mentioned for the proposed Reuse Plan and Residential Alternatives, a typical per capita solid waste generation rate for residential and commercial use is 3.8 lbs (1.7 kg) per day (Tchobanoglous,

Theisen and Vigil, 1993). Per capita solid waste generation by approximately 9,000 people under the proposed Aviation Alternative would therefore result in the generation of approximately 17 tons (16 metric tons) of solid waste per day. This would exceed historical per capita generation of solid waste at NAWCAD of roughly 10 tons (9 metric tons) per day from up to 5,000 people. As with the proposed Reuse Plan, despite the increase in solid waste generation, it is anticipated that implementation of the Aviation Alternative would have no significant adverse effect. Disposal of solid waste would continue to follow federal and state regulations, and would be in compliance with the *Bucks County Municipal Waste Management Plan*.

Other Utilities

Natural gas would continue to be provided by PECO Energy. Existing telephone lines would be available under the Aviation Alternative. No significant impacts to these utilities would be expected.

4.8 Cultural Resources

Section 106 of the National Historic Preservation Act provides that federal agencies take into account the effect of their actions on any district, site, buildings, structure or object included in or eligible for inclusion in the National Register of Historic Places. Implementing regulations for Section 106 are contained in 36 CFR 800, *Protection of Historic Properties*. These regulations provide specific criteria for assessing the effect of federal undertakings on historic properties and identifying adverse effects of proposed undertakings on historic properties. The effects that a proposed undertaking will have on a cultural resource are predicted on the significant characteristics or distinguishing elements of the resource and the design and anticipated consequences of the undertaking. Effects to cultural resources on or eligible for listing in the National Register of Historic Places are evaluated with regard to the *Criteria of Effect and Adverse Effect*, established by the Advisory Council on Historic Preservation (36 CFR 800.9). These criteria are summarized in Table 4.8-1.

The cultural resources survey conducted at NAWCAD (TAMS and John Milner Associates, 1996) identified seven structures that could be considered eligible for the National Register of Historic Places. Spanning almost two centuries in age, these structures are considered to be individually eligible for a variety of reasons. Quarters A and B and Bldg 87 are excellent examples of late 18th and early 19th century stone farmhouses and their outbuildings. The Centrifuge (Bldg 70) was a vital component of the Navy's aviation medicine testing program, the X-15 program, and NASA's Project Mercury. The ejection tower (Structure 361) was a key component in the development of Naval aviation, while the inertial guidance test facility and the avionics test platform (Structure 367) were considered significant for their role in the development of safety and navigation systems crucial to the development of important Cold War weapons systems including aircraft, guided missiles and guided munitions. Each building or structure retains historic integrity and clearly conveys a strong association with either rural or military activities. Therefore, this analysis addresses the impacts of implementing the proposed action and its alternatives on the character of the individual buildings.

4.8.1 No Action Alternative

Under future baseline (no action) conditions, there would be no new construction or alteration in the area of the historic buildings. Closure of NAWCAD, except those areas used by the realigned Navy functions (housing) that would continue its operation after closure, would follow the standards and procedures for mothballing facilities published in *Base Realignment and Closure Facility Layaway and Caretaker Maintenance Standards* (Naval Facilities Engineering Command, September 1994). These guidelines and procedures meet the requirements for mothballing historic structures outlined

Table 4.8-1

Criteria of Effect and Adverse Effect

An undertaking has an effect on a historic property when it may alter characteristics of the property that may qualify the property for inclusion in the National Register. For purposes of determining effect, alteration to features of the property's location, setting, or use may be significant depending on a property's significant characteristics and should be considered (36 CFR 800.9[a]).

An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:

1. Physical destruction, damage, or alteration of all or part of the property;
2. Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register;
3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
4. Neglect of a property resulting in its deterioration or destruction; and
5. Transfer, lease, or sale of the property (36 CFR 800.9[b]).

Effects of an undertaking that would otherwise be found to be adverse may be considered as being not adverse for the purpose of these regulations:

1. When the historic property is of value only for its potential contribution to archeological, historic, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines;
2. When the undertaking is limited to the rehabilitation of buildings and structures and is conducted in a manner that preserves the historical and architectural value of the affected historic property through conformance with the Secretary's "Standards for Rehabilitation and Guidelines for Rehabilitating Buildings;" or
3. When the undertaking is limited to the transfer, lease or sale of a historic property, and adequate restrictions or conditions are included to ensure preservation of the property's significant historic features (36 CFR 800.9[c]).

by the National Park Service in *Preservation Brief 31: Mothballing Historic Buildings* (National Park Service, September 1993). By following the Navy and National Park Service guidelines in accomplishing the work, there should be no adverse effect on the historic structures.

4.8.2 Reuse Plan

Under the proposed Reuse Plan, NAWCAD would be redeveloped for a variety of uses. Major elements of the proposed Reuse Plan, ranging from multi-business, R&D, and educational uses to housing and medical care for the homeless, are outlined in Subchapter 2.3.

Since the individual historic resources at NAWCAD are widely separated and quite disparate, the effect of the plan on each historic structure is discussed separately.

Bldg 100 (Quarters A)

This early 19th century farmstead is proposed for use as a group home for pregnant teens and parenting teen mothers. Presumably, this change of use from the commanding officer's quarters to a group home would necessitate changes to the interior plan of the structure. Assuming that these renovations would be carried out according to the Secretary of Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*, there would be no adverse effect resulting from this change of use.

Bldg 101 (Quarters B)

This 18th century farmstead is proposed for use as a group home for five or six persons with mental illness. Presumably this change of use from a senior officer's quarters to a group home would necessitate changes to the interior plan of the structure. Assuming that these renovations would be carried out according to the Secretary of Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*, there would be no adverse effect.

Bldg 87

This late 18th century barn is associated with Bldg 101. It is currently used as a storage facility. Under the Reuse Plan it lacks a specific purpose, but it does not appear to be slated for demolition. The proposed road would pass near the structure but should have no effect on the barn itself. If the barn continues to be used for storage, then the continued use should have no effect on the structure. If the barn is to be mothballed, then the standards and procedures for mothballing facilities published in *Base Realignment and Closure Facility Layaway and Caretaker Maintenance Standards* (Naval Facilities Engineering Command, September 1994) would be followed, and the mothballing would have no adverse effect on the historic properties of the barn.

Bldg 108 (The Inertial Guidance Laboratory)

The inertial guidance laboratory is proposed to continue in its same use under lease to Pennsylvania State University. Since the building would continue in its historic use, there would be no finding of adverse effect. Guidelines for continued use of historically significant high technology laboratories, published in *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities* (Advisory Council on Historic Preservation, 1991), should be followed.

Bldg 70 (The Centrifuge)

The centrifuge is proposed to continue in its same use under lease to one of five prequalified users. Since the building would continue in its historic use there would be no finding of adverse effect. Guidelines for continued use of historically significant high technology laboratories, published in *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities* (Advisory Council on Historic Preservation, 1991), should be followed.

Structure 361 (Ejection Tower)

Structure 361 is proposed to be moved to Patuxent River, Maryland. Since this structure was designed to be moveable and has been moved at least once before (TAMS and Milner, 1996), another move would not affect the historic character of the structure. Therefore, there would be no effect under 36 CFR 800.9 [b].

Structure 367 (Aircraft Support Tower)

As proposed in the Reuse Plan, this aircraft support tower (Structure 367) would be would be disassembled. This action would have an adverse effect because it involves the physical destruction, damage or alteration of all or part of the property (36 CFR 800.9[b]1).

4.8.3 Residential Alternative

As a result of the similarities in land use in the vicinity of the eligible buildings of both the Reuse Plan and the Residential Alternative, the impacts on the cultural resources at NAWCAD would be the same.

4.8.4 Aviation Alternative

As a result of the similarities in land use in the vicinity of the eligible buildings of both the Reuse Plan and the Aviation Alternatives, the impacts on the cultural resources at NAWCAD would be the same.

4.9 Natural Resources

4.9.1 No Action Alternative

Under the future baseline (no action) conditions, existing natural resources would remain unchanged. All identified wetlands within the base would remain intact. The proposed closure of NAWCAD would have no direct adverse impact on existing vegetation, wildlife, floodplains, or topography, geology, and soils. The base closure would result in much fewer cars (other than residents in the military housing) on the base which would be a positive impact on resident wildlife.

4.9.2 Reuse Plan

Vegetation

Existing vegetation communities in the areas of the runways, taxiways, and developed areas along roadways are characterized by maintained turf lawns with ornamental and opportunistic tree and shrub species. Development of these areas under the proposed Reuse Plan would result in the decrease of these low-value communities. The extreme eastern portion of the site has not been used by NAWCAD and is currently farmland. The development of park and recreation land in this area would result in a change from farmland to athletic fields surrounded by maintained lawn with ornamental trees. The area just south of the enlisted family housing is currently degraded woodland and would remain as woodland under the proposed Reuse Plan.

Wildlife

No adverse impact to wildlife would be expected to occur with implementation of the proposed Reuse Plan. Open space would still be available to the wildlife species that currently utilize the site, and the woodland habitat just south of the family housing would remain unaltered. There would be no impact to threatened and endangered species as no such species or their habitats are known at the site.

Wetlands

Existing background information, coupled with a field reconnaissance, indicates that a small acreage of freshwater wetlands (approximately one to five acres [0.4 to 2 hectares]) occurs on site. The proposed Reuse Plan provides a broad planning framework for NAWCAD that would serve to guide future development; there are therefore no detailed site plans at this time. Specific impacts of the reuse on wetlands would depend on specific site development in the future.

All disturbances to wetlands would require a permit from the US Army Corps of Engineers (COE) and the PA Department of Environmental Protection. Since the PA Department of Environmental Protection's wetland program is more stringent than the COE's wetland program, the Commonwealth's application requirements are described below. Federal permit requirements would be met by fulfilling the state requirements.

Wetland permit applications would require, at a minimum, a floodplain management analysis; alternatives analysis; mitigation plan; impact analysis; a surveyed wetland boundary; and a stormwater management analysis. In connection with the alternatives analysis, the *Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404 (b)(1) Guidelines* emphasizes:

- Avoidance - avoid potential impacts to the maximum extent practicable;
- Minimization - take appropriate and practicable steps to minimize the adverse impacts (e.g., limit the anticipated impact to an area of the wetland with lesser value than other areas, or reduce the actual size of the impacted area); and
- Compensatory Mitigation - take appropriate and practicable compensatory mitigation action for unavoidable adverse impacts which remain after all appropriate and practicable minimization has been required (created a new wetland area, restore existing degraded wetland, or enhance low value wetland into improved wetland).

Adherence to this hierarchy would be required for any future development that would disturb wetland acreages at NAWCAD.

Floodplains

Because NAWCAD does not lie within the 100-year or 500-year floodplain, the proposed Reuse Plan would have no impact on floodplains.

Topography, Geology, and Soils

Specific development activities under the proposed Reuse Plan would involve earthmoving activities. An erosion and sedimentation control program, which applies to such activities, has been developed by the PA Department of Environmental Protection. The primary requirement of this program is that all persons engaged in earthmoving activities must develop and implement soil erosion and sedimentation control measures, and set forth such measures in a soil erosion and sedimentation control plan. In addition, the Department of Environmental Protection's regulations require that, prior to the commencement of most earthmoving activities, an earth distribution permit must be obtained from the Commonwealth's Bureau of Soil and Water Conservation. Permit applications accompanied by erosion and sedimentation control plans are submitted to the county conservation

district, which conducts an initial technical review of the plan and forwards the application to the Commonwealth's Bureau of Soil and Water Conservation for final permit issuance. The submission of such a soil erosion and sedimentation control program would be required for future earthmoving construction activities at NAWCAD.

4.9.3 Residential Alternative

Vegetation

Development of areas that are currently characterized by maintained lawns with ornamental trees would result in the decrease or loss of such communities; however, the Residential Alternative would feature buffer areas in and around the proposed residential units, which would also be characterized by lawns and ornamental trees. Similar to the proposed Reuse Plan, the development of a park and recreation area from land that is currently farmland would result in a change from farmland to athletic fields surrounded by maintained lawn with ornamental trees. The area just south of the enlisted family housing is currently degraded woodland and would remain as woodland with the Residential Alternative.

Wildlife

No adverse impact to wildlife would be expected to occur with implementation of the Residential Alternative. Open space characterized by maintained lawns and ornamental trees would remain available to the wildlife species which currently utilize the site, and the woodland habitat just south of the family housing would remain unaltered. There would be no impact to threatened and endangered species as no such species or their habitats are known at the site.

Wetlands

As with the proposed Reuse Alternative, specific impacts of the Residential Alternative on wetlands would depend on specific site development in the future. As discussed in Subchapter 4.9.2, all disturbances to wetlands would require a permit from the COE and the PA Department of Environmental Protection, with avoidance being the preferred strategy.

Floodplains

Because NAWCAD does not lie within the 100-year or 500-year floodplain, the Residential Alternative would have no impact on floodplains.

Topography, Geology, and Soils

Implementation of the Residential Alternative would involve significant earthmoving activities, and would require the submission of an erosion and sedimentation control plan to the PA Department of Environmental Protection. As described above in Subchapter 4.9.2 (Topography, Geology, and Soils), this plan must be designed to minimize potential impacts during construction.

4.9.4 Aviation Alternative

Vegetation

Development of areas that are currently characterized by maintained lawns with ornamental trees would result in the decrease or loss of such vegetation under the Aviation Alternative. Similar to both the proposed Reuse Plan and Residential Alternatives, the development of a park and recreation area from land that is currently farmland would result in a change from farmland to athletic fields surrounded by maintained lawn with ornamental trees. The area just south of the enlisted family housing is currently degraded woodland and would remain as woodland with the Aviation Alternative.

Wildlife

No significant adverse impact to wildlife would be expected to occur with implementation of the Aviation Alternative. The woodland habitat just south of the family housing would remain unaltered. There would be no impact to threatened and endangered species as no such species or their habitats are known at the site.

Wetlands

As with the proposed Reuse Plan and Residential Alternatives, specific impacts of the Aviation Alternative on wetlands would depend on specific site development in the future. As discussed in Subchapter 4.9.2, all disturbances to wetlands would require a permit from the COE and the PA Department of Environmental Protection, with avoidance being the preferred strategy.

Floodplains

Because NAWCAD does not lie within the 100-year or 500-year floodplain, the Aviation Alternative would have no impact on floodplains.

Topography, Geology, and Soils

Implementation of the Aviation Alternative would involve significant earthmoving activities, and would require the submission of an erosion and sedimentation control plan to the PA Department of Environmental Protection. As described above in Subchapter 4.9.2 (Topography, Geology, and Soils), this plan must be designed to minimize potential impacts during construction.

4.10 Petroleum and Hazardous Substances

4.10.1 No Action Alternative

Under the no action alternative, the Navy would continue to provide for cleanup of contaminated sites as identified in the Federal Facilities Agreement between the Navy and EPA (September 1990). With the closure of NAWCAD in September 1996, use of most hazardous materials would cease. There may be some use of chemicals in the Pump and Treat Facility constructed as part of the groundwater cleanup program. Environmental compliance activities at NAWCAD would continue for all facilities.

4.10.2 Reuse Plan

Hazardous Substances/Waste Quantities

With implementation of this alternative, the use of hazardous materials by the Navy at NAWCAD would cease. This would result from a realignment of most of the RDT&E functions from NAWCAD to Patuxent River, Maryland. Environmental compliance activities at NAWCAD would continue for storage tanks, hazardous substances and hazardous waste, PCBs, asbestos, and NPDES permits. The *BRAC Cleanup Plan* (BRAC Cleanup Team and EA Engineering, March 1995) describes compliance strategies in detail.

The Reuse Plan (Subchapter 2.3) provides for a new industrial/business/office R & D complex on the Jacksonville Road and Street Road frontages. Some hazardous substances may be generated by the operation and maintenance of private industries locating in this area. The amount of hazardous substances that might be used by these industries cannot be quantified at this time, as the nature of industries that would locate in the excessed area is not known. Hazardous substances users would be subject to inspection by the Bucks County Fire Department and would be required to file information on hazardous material usage with the PA Department of Environmental Protection.

Site Contamination

The transfer of excess DoD property related to base closures and realignments is a two-step process: (1) review of currently available information and preparation of an Environmental Baseline Survey (EBS); and (2) preparation of a Finding of Suitability for Transfer (FOST). The purpose of the FOST is to report the environmental suitability of a parcel for transfer to nonfederal agencies or to the public by disclosing that one of the following is true:

1. No hazardous substances were stored for one year or more, or are known to have been released or disposed of on the parcel; or

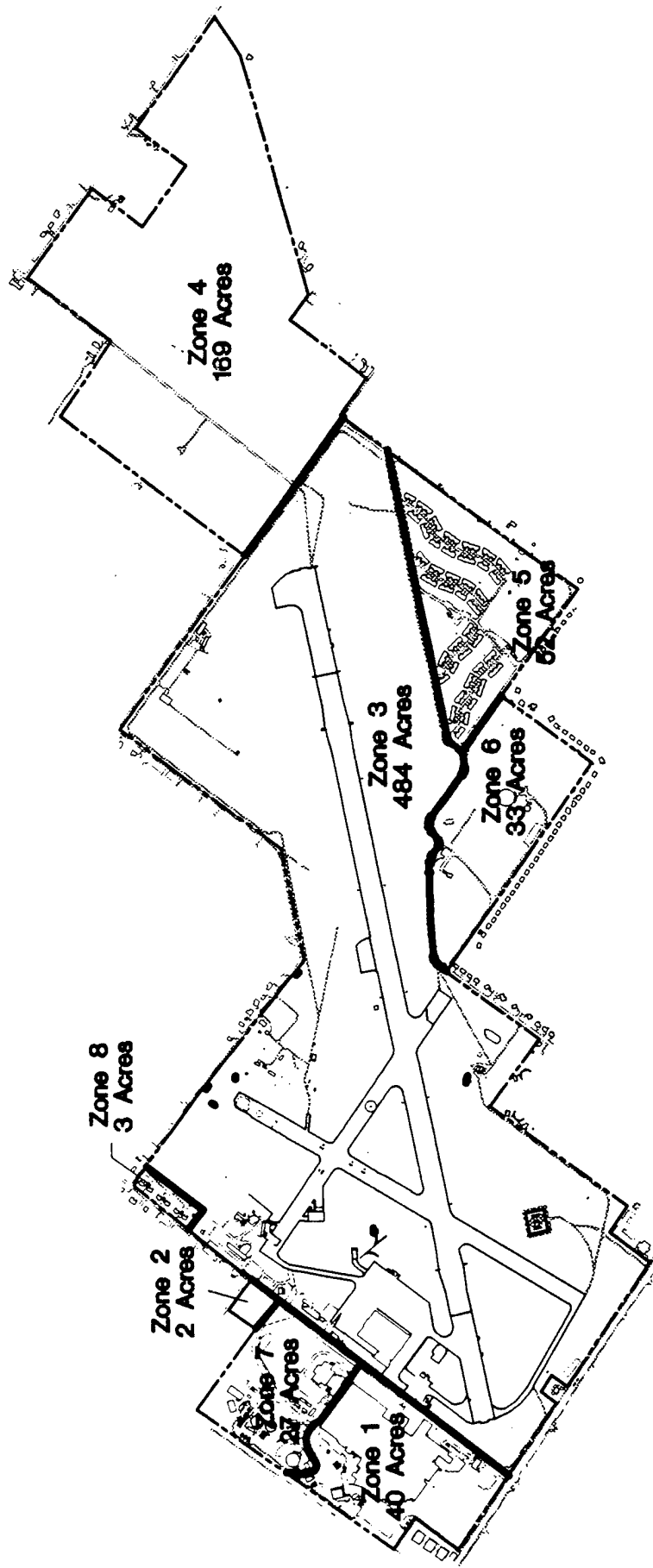
2. The requirements CERCLA 120(h)(3) have been met for the parcel being transferred, which specifies that where item (1) above does not apply, deeds to transfer must disclose/contain:
 - a. information on the type and quantity of the release of hazardous substances, and a description of the remedial action (RA) taken;
 - b. a covenant warranting that approved remedial design has been completed and the remedy has been demonstrated to USEPA to be operating properly and successfully and any additional remedial action found to be necessary after the date of such transfer shall be conducted by the federal government; and
 - c. a clause granting the federal government access to the property for remedial action.

Completion of remedial action does not necessarily have to take place prior to property transfer. If the construction and installation of an approved remedial design has been completed, and the remedy has been demonstrated to the USEPA to be operating properly and successfully, the property could be transferred prior to complete remediation.

In the 1995 EBS, NAWCAD was divided into eight geographic zones (Figure 4.10-1, NAWCAD Hazardous Waste Cleanup Zones). To further facilitate the disposal and reuse process, the BRAC Cleanup Team prepared the *1996 Business Plan* for NAWCAD, which is essentially an update to the BRAC Cleanup Plan. This plan identifies what are referred to as "Environmental Sites" (sites) at NAWCAD. These are defined as "a portion of NAWCAD property targeted for closure which, at a minimum, requires an investigation to determine if the property presents a threat to human health and the environment and thus requires a cleanup prior to leasing or transfer." The sites are shown in Figure 4.10-2 (Environmental Sites at NAWCAD).

Environmental Sites	
• Environmental Site 1-	Area A;
• Environmental Site 2-	Area B;
• Environmental Site 3-	Area C;
• Environmental Site 4-	Area D;
• Environmental Site 5-	The balance of NAWCAD property targeted for transfer (Zones 1, 2, 3, and 4);
• Environmental Site 6-	All buildings (and associated structures/soils) targeted for transfer

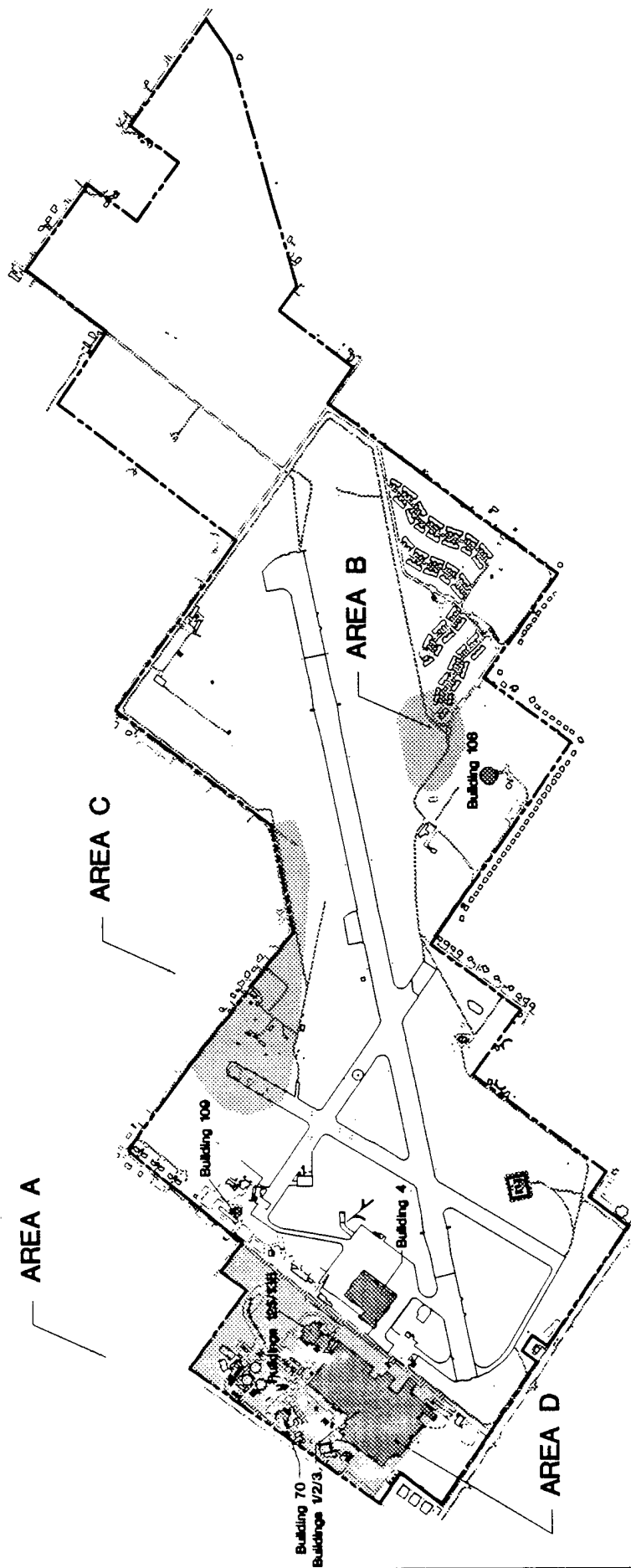
NAWCAD Hazardous Waste Cleanup Zones






Source: EA Engineering, Science, and Technology, Inc., March 1995.

Figure 4.10-1

Environmental Sites at NAWCAD



-  Buildings Targeted for Transfer
-  Areas Targeted for Transfer
-  Property Boundary

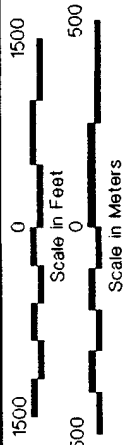


Figure 4.10-2

Source: BRAC Cleanup Team, 1996.

Releases of hazardous wastes or substances to the soil and/or groundwater have occurred within Areas A, B, C, and D. The releases of concern will be investigated and remediated, as specified by CERCLA and/or RCRA. Due to recent legislative changes, not all of NAWCAD is included in the CERCLA/SARA program. Therefore, the USEPA has no enforceable agreement with the Navy regarding the performance of remedial investigations or actions under CERCLA at those areas of NAWCAD that are not included in the program. However, the Navy is conducting all remedial activities in accordance with CERCLA and the National Contingency Plan. For areas of known releases of hazardous wastes or substances to soil and/or groundwater, CERCLA requires a Remedial Investigation (RI). In addition, for each area, and for the remaining property targeted for transfer, studies will be conducted to determine if hazardous substances, hazardous wastes, and/or petroleum products have been stored, released, or disposed. If release or disposal of such substances is confirmed, CERCLA and/or RCRA cleanup requirements will be met prior to property transfer.

The BRAC Cleanup Team (BCT) is coordinating with the FLRA in addressing the environmental issues related to transfer parcels scheduled for reuse. The Department of the Navy Policy Memorandum 95-02, *Consideration of Future Land Use in Determining Cleanup Standards for Base Realignment and Closure Property* (August 17, 1995), applies to the cleanup of NAWCAD. In addressing the cleanup levels, the BCT would give consideration to BRAC future land use as identified in the proposed Reuse Plan.

Based on the input of the FLRA, adjacent municipalities and boroughs, the BRAC Cleanup Team has identified the following priorities (BCP, 1996):

- Issue Findings of Suitability to Lease (FOSLs) for selected buildings;
- Intensify Source Identification and EBS work for property west of Jacksonville Road and EBS work for other properties targeted for transfer/early reuse;
- Prepare agricultural outlease property for reuse by issuing a FOST;
- Conduct a removal action, issue a Record of Decision (ROD) and FOST for Site 4;
- Select and conduct a removal action at Site 6 in Area B;
- Complete groundwater investigations in Areas A and B and select final remedial actions; select interim remedial action for Area D groundwater while investigations continue;
- Begin groundwater pump and treat operations for Areas A and C; initiate construction of interim action for Area D groundwater; and
- Continue the groundwater monitoring program.

Both investigations and cleanup actions will be completed as soon as practicable, so that all known environmental problems are either under remediation or the problem is defined and a cleanup strategy is selected. While the most critical environmental problem at NAWCAD is the groundwater contamination, it is recognized that reuse can proceed concurrently with the groundwater cleanup, primarily through initially leasing facilities. Other environmental concerns, identified by the regulators and the initial EBS, will be addressed consistent with priorities identified for the reuse of the base.

Building Use and Reuse by the Community

The BRAC 95 properties and their prospective reuses are outlined in Subchapter 2.3. Any reuse, modification, renovation, and/or demolition of buildings would have to address the issues of lead-based paint and asbestos:

- **Lead-based Paint** - Due to the age of most of the buildings at the NAWCAD, the presence of some lead-based paint should be assumed as a possibility. Reuse and/or modifications to any of the buildings would take into consideration the likelihood of a lead-based paint hazard relative to reuse.
 - **Asbestos** - Asbestos must be removed in accordance with 40 CFR Part 61 Subpart M (National Emission Standard for Asbestos) and Part 61.145 (Standard for Demolition and Renovation).
-

4.10.3 Residential Alternative

Under the Residential Alternative, the scale of the industrial/business park would be reduced to 65 acres (26 hectares), reducing the amount of hazardous generation from these facilities. A residential format for this parcel would probably generate little hazardous waste other than herbicides for grounds maintenance.

4.10.4 Aviation Alternative

The Aviation Alternative would keep the airfield in operation as a general aviation facility. Operation of an airfield would generate petroleum and hazardous substance during routine maintenance and operation of aircraft. Under the Aviation Alternative, the scale of the industrial/business park would increase to 284 acres (115 hectares), which would increase the potential for generation of hazardous substances.

4.11 Cumulative Impacts of the Preferred Alternative

This chapter addresses the cumulative impacts of the preferred alternative, the Reuse Plan. Cumulative impacts have been defined by the Council on Environmental Quality (CEQ) in 40 CFR 1508.7 as:

"impacts on the environment which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."

The CEQ regulations also state that the cumulative impacts addressed should not be limited to those from actual proposals, but must include impacts from actions being contemplated or that are reasonably foreseeable.

Cumulative impacts upon the study area as a result of the redeveloped NAWCAD would include the phase-out and closure of the base itself. In 1990, base personnel loading totaled 4,605 personnel. This number declined to 1,398 in August 1995 and to 1,129 in May 1996; at the time of closure in 1996, there will be approximately 20 personnel to maintain the facility in caretaker status. The loss of this employment center and its ancillary functions is a significant feature that is included in baseline conditions (e.g., traffic volumes generated by the base have declined, and will continue to decline up to its closure). Impacts generated by a redeveloped NAWCAD have taken into account this anticipated reduction.

Interviews with Bucks County planners and township officials conducted in 1995 and 1996 indicated no major new projects were planned in the study area. The most significant project identified was the new Wal-mart store on Street Road at Jacksonville Road that opened January 1996. The Wal-mart traffic studies submitted to PENNDOT were incorporated into the traffic analysis in Section 4.4. Other proposed projects identified by township officials were:

- a new residential subdivision for approximately 400 units in Warwick Township, beyond the one-mi (1.6-km) study area; and
- a small industrial subdivision of 20 acres (8 hectares) (26 parcels but with no specific projects identified) about one-half mi (one km) northwest of NAWCAD in Warminster.

These other projects are relatively small and are included within the background growth factors used in the traffic analysis or demographic projections for the area.

5 MITIGATION MEASURES

The need for mitigation measures with respect to implementation of the proposed Reuse Plan and its alternatives is addressed below.

5.1 Reuse Plan

5.1.1 Land Use

No significant environmental impacts have been identified and therefore no mitigation is required.

5.1.2 Socioeconomics

No significant environmental impacts have been identified and therefore no mitigation is required.

5.1.3 Community Facilities and Services

No significant environmental impacts have been identified and therefore no mitigation is required.

5.1.4 Transportation

Implementation of the Reuse Plan would cause significant impacts at most of the study area intersections. Several potential mitigation measures have been investigated, including signal modifications, geometric improvements, and regulatory measures.

The feasibility of introducing mitigation measures at each intersection impacted was evaluated. The configuration of certain intersections would preclude further widening (i.e., existing left turn lanes), while others support adjacent development that would be substantially impacted if geometric improvements were undertaken. A summary of potential improvements at each intersection considered follows:

- Bristol Road and Jacksonville Road - The Reuse Plan would introduce an additional approach to this existing unsignalized T-intersection. To mitigate the adverse impacts, signalization of this intersection has been suggested. Minor widening of each of the approaches also would be necessary. These measures would significantly improve operations over unmitigated conditions and result in a more favorable LOS

than under no action conditions. Overall operation is LOS D during the am peak and LOS F during the pm peak.

- Street Road and Jacksonville Road - The majority of project-generated trips would be surcharged onto this intersection. Therefore, in order to mitigate the resulting impacts, significant improvements would be necessary. The mitigated conditions assume dual left turn lanes for all approaches (existing conditions provide one left turn lane per approach). In addition, the widening of the Jacksonville Road approaches would provide two through lanes to facilitate movements to and from the project site. Despite these improvements, operation for certain lane groups would remain at LOS F. Overall the mitigated conditions would provide for operation similar to no action conditions.
- County Line Road and Blair Mill Road - To mitigate impacts at this location, minor widening of the Blair Mill Road approach to provide left and right turn lanes has been necessary. This improvement, along with signal adjustments, would provide LOS D and C operation during the am and pm peaks respectively.

The results of capacity analyses based on these mitigated conditions are provided in Table 5-1. As noted, despite these improvements, several intersections continue to operate at undesirable levels. Also, other intersections for which mitigation is not feasible would continue to operate poorly. Therefore, other mitigation measures such as staggered work hours and ride-sharing would be necessary, but have not been evaluated here.

5.1.5 Air Quality

Short-term construction and demolition-related effects on air quality would occur, but impacts could be alleviated through implementation of common construction management practices (e.g., dust suppression, phasing of construction, etc.).

5.1.6 Noise

Demolition and construction activities would temporarily increase noise levels near construction areas. To mitigate for temporary noise effects, these activities would only take place during regular working hours.

5.1.7 Infrastructure

No significant impacts have been identified and therefore no mitigation is required.

Table 5-1
Summary of LOS Analysis - Reuse Plan Mitigated Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
Bristol Road and Jacksonville Road (Location 1)								
EB L	167	0.674	*	F	91	0.800	31.0	D
EB TR	1099	1.553			734	0.980	D32.9	D
WB L	254	1.136	46.3	E	268	2.300	*	F
WB TR	539	0.827			980	1.308		
NB LTR	704	1.244	*	F	866	1.186	*	F
SB LTR	607	0.930	27.6	D	600	0.677	11.3	B
Overall:			*	F			*	F
Bristol Road and Hatboro Road (Location 2)								
EB L	128	0.654	24.2	C	306	1.364	*	F
EB TR	753	0.908	19.9	C	766	0.971	29.9	D
WB L	100	0.526	21.0	C	42	0.193	17.6	C
WB TR	830	0.998	34.2	D	754	0.988	33.8	D
NB LTR	58	0.270	14.5	B	266	1.158	*	F
SB L	147	0.499	16.3	C	150	1.317	*	F
SB TR	243	0.714	20.6	C	132	0.361	14.4	B
Overall:			25.2	D			*	F
Street Road and Jacksonville Road (Location 4)								
EB L	724	1.985	*	F	159	0.476	28.7	D
EB T	965	0.958	34.6	D	1205	1.195	*	F
EB R	398	0.528	13.1	B	229	0.314	11.1	B
WB L	326	0.894	44.0	E	328	0.981	60.6	F
WB T	1082	1.038	52.5	E	984	0.976	38.0	D
WB R	619	0.896	26.8	D	382	0.501	12.8	B
NB L	220	0.802	39.6	D	360	1.185	*	F
NB T	1209	1.383	*	F	506	1.061	72.8	B
NB R	81	0.132	10.8	B	192	0.317	11.9	B
SB L	187	0.684	33.9	D	639	2.103	*	F
SB T	506	0.579	21.4	C	1206	2.531	*	F
SB R	280	0.383	12.5	B	719	1.218	*	F
Overall:			*	F			*	F

Table 5-1

Summary of LOS Analysis-Reuse Plan Mitigated Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	Appr. Volume	V/C Ratio	Stopped Delay	L O S	Appr. Volume	V/C Ratio	Stopped Delay	L O S
County Line Road and Blair Mill Road (Location 6)								
EB TR	1349	1.052	50.2	E	1233	0.989	33.5	D
WB L	489	0.948	36.4	D	481	0.966	40.1	E
WB T	825	0.360	2.4	A	1430	0.645	4.4	A
NB L	90	0.369	23.1	C	160	0.512	23.3	C
NB R	373	0.477	10.8	B	530	0.579	11.5	B
Overall:			30.2	D			20.2	C
Notes: NB-Northbound; SB-Southbound; EB-Eastbound; WB-Westbound								
L-Left turn; R-Right turn; T-Through								

5.1.8 Cultural Resources

Implementation of the Reuse Plan would have an adverse impact on the Aircraft Support Tower (Structure 367). This finding of adverse effect requires that the Navy consult with the Advisory Council on Historic Preservation and the Pennsylvania SHPO in accordance with Section 106 of the NHPA. This process would result in the preparation of a Memorandum of Agreement (MOA) between the three parties providing for appropriate mitigation of project-related impacts.

The primary method of mitigation that could be required is documentation of all demolished structures and their settings. The purpose of documentation would be to record significant characteristics of a property before its alteration or destruction. Depending on the nature of these characteristics, documentation may include preparation of a written description and history, large format photographs printed to archival specifications, or measured or sketched drawings. These items are generally prepared in accordance with Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), or Commonwealth of Pennsylvania guidelines. Should documentation be selected as a mitigative measure, the SHPO may require that the National Park Service be consulted to determine the appropriate type and extent of documentation.

5.1.9 Natural Resources

The only natural resource that may be impacted by implementation of the Reuse Plan would be wetlands (if future development were to affect wetlands). The alternative analysis for any proposed project under the Reuse Plan that would affect wetlands must consider avoiding impacts to wetlands. Only after wetland impacts have been avoided to the greatest extent practicable, should other mitigative measures be considered. Other mitigation measures, as per PA Department of Environmental Protection guidelines, would involve both consideration of area and wetland function. With regard to area, mitigation is required within the same watershed and near the wetland impact. PA Department of Environmental Protection's mitigation ratio is a minimum of 1:1 (i.e., for every acre disturbed by development, one acre of wetlands must be replaced or created).

5.1.10 Hazardous Substances

Section 120(h) of CERCLA addresses property transferred by federal agencies and specifies the contents of deeds to transfer such property. The deeds must contain the following three parts: (1) information regarding the type and quantity of release of hazardous substances and the description of remedial action taken; (2) a covenant warranting that Remedial Action (RA) has been taken and that "any additional remedial action found to be necessary after the date of such transfer shall be conducted by the United States;" and (3) "a clause granting the federal government access to the property for remedial action."

The DoD has adopted specific policies that apply to radon, lead-based paint, and asbestos at BRAC properties, as described in detail in Subchapter 4.10. These policies define the obligation of the Navy with respect to addressing radon, lead-based paint, and asbestos at installations prior to their demolition, transfer, or disposal. Compliance with these policies would ensure that there would be no impacts related to radon, lead-based paint, or asbestos upon transfer of NAWCAD property.

5.2 Residential Alternative

Implementation of this alternative would also result in many of the same impacts in the areas of traffic, air quality, noise, cultural resources, and hazardous substances as were previously described for the proposed Reuse Plan. Executing the same proposed mitigation measures under the Residential Alternative would reduce or eliminate potential impacts.

5.3 Aviation Alternative

Implementation of this alternative would also result in many of the same impacts in the areas of traffic, air quality, noise, cultural resources, and hazardous substances as were previously described for the proposed Reuse Plan. Executing the same proposed mitigation measures under the Aviation Alternative would reduce or eliminate specific impacts.

6 RELATIONSHIP OF THE PROPOSED ACTION TO FEDERAL, STATE, AND LOCAL PLANS, POLICIES, AND CONTROLS

Disposal and reuse of NAWCAD would comply with existing federal regulations and with state, regional, and local policies and programs. The federal acts and executive orders with which the proposed action must demonstrate compliance include:

- NEPA;
- RCRA, CERCLA, and SARA;
- Clean Water Act;
- Clean Air Act;
- Endangered Species Act;
- National Historic Preservation Act;
- Coastal Zone Management Act;
- Toxic Substances Control Act;
- Executive Order 11990, Protection of Wetlands;
- Executive Order 11988, Floodplain Management; and
- Executive Order 12898, Environmental Justice.

For preparation of this environmental impact statement, communication was undertaken with relevant state, regional, and local authorities to determine which existing policies and programs apply to the proposed disposal and reuse.

6.1 National Environmental Policy Act (NEPA)

This EIS has been prepared in accordance with the Council on Environmental Quality regulations implementing NEPA (40 CFR Part 1500-1508) and Navy NEPA procedures (OPNAVINST 5090.1B). Executive Order 11991 of May 24, 1977 directed the Council on Environmental Quality to issue regulations for procedural provisions of NEPA; these are binding for all federal agencies. The Navy has invited comments on this Draft EIS. These comments will be addressed and responded to by the Navy in the final EIS.

6.2 RCRA, CERCLA, SARA, and CERFA

The Resource Conservation and Recovery Act (RCRA) was passed in 1976 and continued earlier provisions relating to solid waste and resource recovery, including hazardous waste. It sets standards for hazardous waste treatment, storage, and disposal facilities.

In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was passed to provide a superfund for cleanup of sites with uncontrolled releases of hazardous substances. This program was continued in the Superfund Amendments and Reauthorization Act (SARA) of 1986. Section 211 of SARA provides continued authorization for the DoD Environmental Restoration Program and the Defense Environmental Restoration Account. Major responsibilities for monitoring compliance with these acts rests with the USEPA. The Navy is conducting all remedial activities in accordance with CERCLA and the National Contingency Plan.

The Navy recognizes its responsibilities for control and management of hazardous substances and wastes in compliance with federal, state, and local requirements. These responsibilities are defined in Chapter 3 of the Navy's Environmental and Natural Resources Protection Manual (US Navy, 1994). Studies and some remedial actions have already been undertaken by the Navy at NAWCAD to identify problem areas related to petroleum and hazardous substances. The Navy will make further assessments regarding cleanup and disposal as required by DoD guidelines.

The Community Environmental Response Facilitation Act (CERFA), Public Law 102-425, requires the identification of all uncontaminated real property, or parcels thereof, at installations undergoing closure or realignment. In accordance with CERFA, the Navy conducted an Environmental Baseline Survey (EBS) that included visual inspections, interviews, and review of plans, logs, maps, aerial photographs, records, and reports. The findings of the EBS were included in a CERFA report (US Navy, 1994) and summarized in Subchapter 3.10 of this EIS. The report also addressed CERCLA requirements to identify parcels on which hazardous substances in quantities greater than or equal to their reportable quantity were stored for more than one year, known to be released, or disposed of on the property.

6.3 Clean Water Act

The Clean Water Act of 1977, which amends the Federal Water Pollution Act of 1972, and subsequent amendments were designed to assist in restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. This covers discharge of pollutants into navigable waters, wastewater treatment management, and protection of relevant fish, shellfish, and wildlife. Section 402 of this act requires a National Pollutant Discharge Elimination System (NPDES) permit for discharges into navigable waters. Congress also passed the Water Quality Act of 1987 to address excessive levels of toxic pollutants still found in some waters.

Depending on the ultimate site development plan, implementation of project alternatives could result in the loss of jurisdictional wetlands under Section 404 of the Clean Water Act (the amount of wetlands filled would be dependent upon the specific reuse that was selected). The alternative analysis for any proposed project under the Reuse Plan that could potentially affect wetlands must first consider avoiding impacts to wetlands. Only after wetland impacts have been avoided to the greatest extent practicable, should other mitigative measures be considered. Other mitigation measures, as per PA Department of Environmental Protection guidelines, would involve both consideration of area and wetland function. Should wetlands be impacted, authorization from the US Army Corps of Engineers and the PA Department of Environmental Protection would be required prior to construction.

Since proposed construction would encompass an area greater than five acres (two hectares), compliance with the USEPA and the Commonwealth of Pennsylvania storm water management regulations would be required, including acquisition of NPDES permits.

6.4 Clean Air Act

The Clean Air Act (CAA) of 1955 and subsequent amendments specify regulations for control of the nation's air quality. Federal and state ambient air standards have been established for each criteria pollutant. The 1990 amendments to the act require federal facility compliance with all applicable substantive and administrative requirements for air pollution control.

Any demolition of buildings or materials associated with reuse activities must comply with established emission and ambient air standards, especially for removal of asbestos materials. This removal would meet the National Emissions Standards for Hazardous Air Pollutants. The asbestos removal contractor would use a landfill approved for asbestos disposal after removing the asbestos-containing materials.

The USEPA has published final rules on general conformity (40 CFR Part 51 in Federal Register, November 30, 1993) that apply to federal actions in areas designated nonattainment for any of the criteria pollutants under the CAA. The rules do not apply to implementation of the Reuse Plan, as the Navy will not retain control of the property after it is disposed.

6.5 Endangered Species Act

The Endangered Species Act of 1973 and subsequent amendments provide for the conservation of threatened and endangered species of animals and plants, and the habitats in which they are found.

Based on available documentation, there are no known endangered species of animals or plants on the NAWCAD site.

6.6 National Historic Preservation Act

This act was passed in 1966 to provide for the protection, enhancement, and preservation of any property that possesses significant architectural, archaeological, historical, or cultural characteristics. Executive Order 11593 of 1974 further defined the obligations of federal agencies concerning this act. Under the regulatory program implementing the National Historic Preservation Act, a federal agency must determine if the subject property is eligible for listing in the National Register of Historic Places (NRHP).

Implementation of the reuse alternatives would have an adverse impact on eligible historic resources. This finding of adverse effect requires that the Navy consult with the Advisory Council on Historic Preservation and the Pennsylvania SHPO in accordance with Section 106 of the NHPA. This process would result in the preparation of a Memorandum of Agreement (MOA) that provides for appropriate mitigation of project-related impacts.

6.7 Coastal Zone Management Act

The Coastal Zone Management Act of 1972 provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs for the coastal zone. This includes the protection of natural resources and management of coastal development. Policy is implemented by the respective state coastal zone management program. Since the proposed action would have no effect on the coastal zone, the Coastal Zone Management Act does not apply.

6.8 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 (TSCA) was enacted to “regulate commerce and protect human health and the environment by requiring testing and necessary use restrictions on certain chemical substances.” Unlike many of the existing environmental laws, TSCA regulates not only the end products of manufacturing or processing activities, but also provides for regulating the manufacture of substances not yet developed, the permitted use of these chemicals, and allowable manufacturing quantities. The act also requires manufacturers to test substance(s), to submit reports and maintain records on their health and environmental effects. TSCA, therefore, regulates chemicals or substances during their entire lifetime.

6.9 Executive Order 11990, Protection of Wetlands

This order of May 24, 1977 directs federal agencies to take action to protect wetlands on their property and mandates review of proposed actions on wetlands through procedures established by NEPA. Depending on the ultimate site development plan, implementation of project alternatives could result in the loss of jurisdictional wetlands under Section 404 of the Clean Water Act (the amount of wetlands filled would be dependent upon the specific reuse that was selected). As mentioned in subchapter 6.3, the alternative analysis for any proposed project under the Reuse Plan that could potentially affect wetlands must first consider avoiding impacts to wetlands. Only after wetland impacts have been avoided to the greatest extent practicable, should other mitigative measures be considered.

6.10 Executive Order 11988, Floodplain Management

This order sets forth federal agency responsibilities for reducing the risk of flood loss or damage to personal property, minimizing the impact of flood loss, and restoring the natural and beneficial functions of floodplains. This order was issued in furtherance of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Plans or proposals for actions of the Navy in floodplain areas would be submitted for public review. Because NAWCAD does not lie within the 100-year or 500-year floodplain, the proposed Reuse Plan would have no impact on floodplains.

6.11 Executive Order 12898, Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was signed on February 11, 1994. It directs all federal departments and agencies to incorporate environmental justice in achieving their mission. Each federal department and agency is to accomplish this by conducting programs, policies, and activities that substantially affect human health or the environment in a manner that does not exclude communities from participation in, deny communities the benefits of, or subject communities to discrimination under such actions, because of their race, color, or national origin.

As evaluated in accordance with Executive Order 12898, the direct and indirect effects of the proposed disposal and reuse are not expected to cause adverse environmental or economic impacts specific to any groups or individuals from minority or low-income populations residing in the study area. Neither would any persons be displaced as a result of proposed disposal and reuse of the former NAWCAD site.

In addition, the wide mailing and the publication of the newspaper notice announcing availability of the original DEIS and FEIS would allow the general public (including minority and low-income individuals and populations) the opportunity to comment on the proposed reuse. There were no groups identified during the Scoping Hearing that represented minority or low-income individuals.

6.12 State and Local Plans and Policies

The Navy pursues close and harmonious planning relations with local and regional agencies and planning commissions of adjacent cities, counties, and states for cooperation and resolution of mutual land use and environment-related problems. In addition, coordination may be made with state and regional planning clearing houses as established by Executive Order 12372 of 1982.

In preparing this EIS, relevant state, regional, and local agencies were contacted for information on the impact of the proposed disposal and reuse of NAWCAD. Execution of the proposed Reuse Plan would require financial incentives, additional public investment, and an appropriate governance structure to control and implement the proposed development.

7 UNAVOIDABLE ADVERSE EFFECTS

The disposal and reuse of NAWCAD pursuant to the proposed Community Reuse Plan would result in the following unavoidable adverse effects:

- Transportation: The additional trips generated by the proposed action would create considerable traffic delays at all study area intersections, since the existing street network offers limited residual capacity. Under the Community Reuse Plan alternative, all intersections would operate at unacceptable levels (LOS "F") during the peak hours. Mitigation for transportation impacts is described in Chapter 5.
- Noise: While most hourly L_{eq} noise increases would not be significant, during some early morning hours (5 am to 7 am) noise levels increases would be noticeable (e.g., 4 & 5 decibel increases). However, in general, the noise level monitoring program established that existing noise levels are already high and are typical of a suburban neighborhood.
- Cultural Resources: Proposed actions would have an adverse effect on eligible historic resources due to the physical destruction and alteration of eligible structures. However, mitigation would likely be achieved in the form of historic building documentation as described in Chapter 5.
- Natural Resources: Implementation of the proposed Reuse Plan could potentially impact freshwater wetlands, with the amount dependent upon the ultimate site configuration. The alternative analysis for any proposed project under the Community Reuse Plan that would affect wetlands must consider avoiding impacts to wetlands. Only after wetland impacts have been avoided to the greatest extent practicable, should other mitigative measures be considered. Mitigative measures for these potential impacts are described in Chapter 5.

8 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Positive consequences of implementing the proposed Reuse Plan would include the replacement of employment opportunities for job losses that have occurred as a result of the closure of NAWCAD. The level of economic activity formerly generated by the facility would be recaptured and the conditions that would be essential to competitive enterprise of the future would be created. As such, the proposed action is intended to enhance long-term productivity in the Bucks County region.

During the proposed construction and demolition phases of the disposal and reuse of NAWCAD, there would be some short-term adverse impacts on the environment. These would include some vehicular traffic disruptions, increased noise levels associated with construction activities, and diminution of air quality due to fugitive dust and vehicular emissions.

Longer term negative impacts would include increases in traffic volumes and consequent air quality and noise impacts. The proposed Reuse Plan could also result in significant generation of sewage, water usage, and energy consumption. None of the impacts, however, would be expected to adversely affect long-term productivity.

9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

While the disposal and reuse of the NAWCAD property would bring benefits to Bucks County, nonrenewable resources would be consumed during the design, construction, and implementation of the proposed action. Since the reuse of these resources is impossible, they must be considered irreversibly and irretrievably committed to the development of the proposed project. The finite resources that would be irretrievably committed by implementation of the proposed reuse are the expendable materials such as steel, concrete, and glass; fuel and other forms of energy utilized during construction activities; and the supplies and energy resources (in the form of water for steam and gas and electricity expended in heating and cooling new facilities) necessary to operate and maintain new facilities after construction.

If construction in wetlands occurs, it would result in the loss of wetlands as a natural resource. Measures could be implemented, however, to offset this loss (see Chapter 5).

Private funds committed to the design, construction, and operation of the proposed redevelopment are not available for the use of other projects. Additionally, the disposal of construction debris including asbestos and lead-based paint would also result in an irreversible and irretrievable commitment of landfill or other solid waste disposal capacity.

Implementing the proposed Reuse Plan would have an adverse effect on an eligible historic resource - the Aircraft Support Tower (Structure 367), which would be disassembled. This resource would be irretrievably lost, although it would be documented in accordance with requirements of the SHPO and the Advisory Council on Historic Preservation.

The public services that would be provided in connection with new development at NAWCAD (e.g., police and fire protection services) also constitute resource commitments that might otherwise be used for other programs or projects, although the proposed reuse components would also generate tax revenues to provide additional public funds for such activities. The human labor expended for development and operation of the proposed reuse scheme would also be considered irrevocable.

10 PUBLIC REVIEW PROCESS AND RESPONSE TO COMMENTS

Public involvement in the review of Draft Environmental Impact Statements (DEISs) is stipulated in 40 CFR Part 1503 of the Council on Environmental Quality's (CEQ) regulations implementing the National Environmental Policy Act (NEPA), and in OPNAVINST 5090.1B. These regulations and guidance provide for active solicitation of public comment via scoping meetings, public comment periods, and public hearings. This chapter has been prepared to respond to the specific questions and comments raised by individual commentors during the public comment period on the *Draft Environmental Impact Statement for Disposal and Reuse of NAWCAD Warminster*.

10.1 Public Review Process

10.1.1 Filing and Distribution of the Draft Environmental Impact Statement

The formal Notice of Intent to Prepare an EIS for disposal and reuse of NAWCAD Warminster was published in the *Federal Register* on September 25, 1995. The scoping meeting was held on October 12, 1995 in Warminster, Pennsylvania.

Upon publication of a formal Notice of Availability published by USEPA *Federal Register*, the public review period for the DEIS will commence. The DEIS will be distributed to officials of federal, state, and local governments, citizen groups and associations, and other interested parties.

10.1.2 Public Review Period and Public Hearings

The remainder of this portion of the DEIS will be finalized after completion of the public review period.

ACRONYMS

ACM AIL ALS AMAL ASO AST AV AVO	Asbestos-containing material Aeronautical Instrument Laboratory Advanced Life Support Aviation Medical Acceleration Laboratory Aviation Supply Office Above Ground Storage Tank Assessed Value Average Vehicle Occupancy
BCP BCT BEA Bldg(s) BLS BRAC	Base Realignment and Closure Cleanup Plan BRAC Cleanup Team Bureau of Economic Analysis Building(s) Bureau of Labor Statistics Base Closure and Realignment Act
CAA CAAA CEQ CERCLA CERFA CFC CFR CO COE	Clean Air Act Clean Air Act Amendments of 1990 Council on Environmental Quality Comprehensive Environmental Response, Compensation, and Liability Act Community Environmental Response Facilitation Act Chlorofluorocarbon Code of Federal Regulations Carbon Monoxide Corps of Engineers (US Army)
dB dBA DEIS DNL DoD DON DRMO	Decibel Decibel (A Scale) Draft Environmental Impact Statement Day-night Average Sound Level Department of Defense Department of the Navy Defense Reutilization and Marketing Office
EBS EDA EIS EO ETR	Environmental Baseline Survey Economic Development Administration Environmental Impact Statement Executive Order Employee Trip Reduction

FAA FBO FEIS FEMA FHWA FIRM FIC FLRA FONSI FOSL FOST	Federal Aviation Administration Fixed Base Operators Final Environmental Impact Statement Federal Emergency Management Agency Federal Highway Administration Flood Insurance Rate Map Federal Interagency Committee Federal Lands Reuse Authority Finding of No Significant Impact Finding of Suitability to Lease Finding of Suitability to Transfer
FS FTZ FY	Feasibility Study Foreign Trade Zones Fiscal Year
GA GIS gpm	General Aviation Geographic Information System Gallons Per Minute
HAP HT HUD	Hazardous Air Pollutants High Tension Department of Housing and Urban Development
ICSP IO IRP	Industrial Communities Site Program Input Output Matrix Installation Restoration Program
kv kw	Kilovolts Kilowatts
L _{dn} L _{eq} LBP LOS	Day-Night Sound Level Equivalent Sound Level Lead-based Paint Level of Service
MCL MH/MR MOA mph MR	Maximum Contaminant Level Mental Health and Retardation Memorandum of Agreement Miles Per Hour Military Reservation
NAAQS NAMU NAVFACENGCOM NAWCAD NEPA NO ₂ NPDES NPL NRHP NWI	National Ambient Air Quality Standards Naval Aircraft Modification Unit Naval Facilities Engineering Command Naval Air Warfare Center Aircraft Division National Environmental Policy Act Nitrogen Dioxide National Pollutant Discharge Elimination System National Priorities List National Register of Historic Places National Wetlands Inventory

O ₃ O&M OU	Ozone Operations and Maintenance Operable Unit
PASS Pb PCB PECO PEM PENNDOT PILOT PIP PL PM PNDI ppm	Pennsylvania Archaeological Site Survey Lead Polychlorinated Biphenyl PECO Energy Palustrine Emergent Wetlands Pennsylvania Department of Transportation Payment in Lieu of Taxes Planned Industrial Park Public Law Particulate Matter Pennsylvania Natural Diversity Inventory Parts per Million
RA RFP RCRA RI RIMS RONA ROD RDT&E	Remedial Action Request for Proposal Resource Conservation and Recovery Act Remedial Investigation Regional Input/Output Model System Record of Non-applicability Record of Decision Research, Development, Test, and Evaluation
SARA SEL SEPTA SHPO SICC SIP SO ₂ sq ft sq m SWMU	Superfund Amendments and Reauthorization Act Sound Exposure Level Southeastern Pennsylvania Transportation Authority State Historic Preservation Officer State Industrial Classification Codes State Implementation Program Sulfur Dioxide Square Feet Square Meters Solid Waste Management Unit
TAMS TSCA TIF tpy TSP	TAMS Consultants, Inc. Toxic Substances Control Act Tax Increment Financing Districts Tons Per Year Total Suspended Particulates
ULI USEPA USFWS UST	Urban Land Institute United States Environmental Protection Agency United States Fish and Wildlife Service Underground Storage Tank

Disposal and Reuse

VFR VOC vph	Visual Flight Rules Volatile Organic Chemicals Vehicles Per Hour
XRF	X-ray Flourescent Analysis

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Disposal and Reuse

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APPENDIX B
FEASIBILITY OF CIVIL AVIATION REUSE



B.1 Introduction

As part of the EIS being prepared by the US Navy for the disposal and reuse of NAWCAD, it is necessary to evaluate the reasonableness of continued aviation use of the facility in the alternatives analysis. A multi-step process was used to assess the alternative and is described below.

B.2 Climate of Businesses and Manufacturers Near NAWCAD

The first step in this evaluation is to assess the types of businesses and manufacturers that exist in the vicinity of NAWCAD, particularly in Bucks and Montgomery Counties. The NAWCAD site is located in Bucks County and is approximately one mile (1.6 kilometers) from the border between Bucks and Montgomery Counties. These counties would potentially be the most directly affected by the operation of an airport at NAWCAD.

Several organizations were contacted to obtain information regarding the use of aviation in the local economy. These organizations included local chambers of commerce and industrial and manufacturing development boards, etc. From the information received, the regional business and manufacturing climate is attractive and healthy. The local economy is diverse and has a highly skilled labor force.

Between April 25 and May 1, 1996, interviews were conducted with managers and owners of seven local businesses and industries. These interviews verified the general economic information and provided a perspective on the existing and potential demand for an airport at NAWCAD. These companies were asked a series of questions to determine interest or need for additional aviation services in the North Philadelphia area. Copies of these are included at the end of Appendix B (in Attachments section).

From these interviews, businesses and manufacturers in the immediate vicinity of NAWCAD indicated that good commercial air passenger service is available. Although similar comments were provided about air cargo service, several of the smaller firms stated that NAWCAD could offer an attractive alternative for shipments of their finished goods and/or raw materials in lieu of using Philadelphia International Airport.

Aviation services are available to these companies at smaller general aviation airports in the area (i.e., charter passenger service, on-demand or unscheduled shipment of goods/parts, etc.). These services are used to some extent, but not extensively. Few reasons were given for this.

B.3 Analysis of Existing and Future Aviation Demand and Capacity of the Region

An evaluation of the feasibility of converting NAWCAD to a civilian use airport was conducted. This evaluation considered Warminster as a potential addition to Philadelphia's regional airport/airspace system. The analysis considered several issues, including:

- Airspace constraints with existing commercial service, commuter and military airports;
- Existing and future demand at regional airports;
- Instrument approach capability;
- Future airport sponsorship;
- Interest in airline or operator investment; and,
- Reasonable role in the regional aviation system for Warminster.

An inventory of commercial passenger demand, freight/cargo activity, and general aviation demand was conducted to establish baseline conditions for evaluating the feasibility of reusing NAWCAD as a future civilian airport. Local governments and regional aviation planners were contacted to obtain current information on the regional perspective and on an individual airport basis.

The most recent study obtained was the *2020 Regional Airport System Plan for the Delaware Valley* (RASP), published in August 1995 by the Delaware Valley Regional Planning Commission (DVRPC). The Delaware Valley RASP provided the most comprehensive information regarding the demand and capacity of the region's existing aviation facilities. Users (airlines) of these facilities and fixed base operators (FBOs) were also contacted. In addition, nine agencies or companies were interviewed and were asked to verify or supplement the database with demand/capacity information.

B.3.1 Potential Sponsorship for Warminster

The Delaware Valley Region is a major center for general aviation activity in the US. However, it is experiencing a severe crisis for accommodating general aviation activity from the lack of municipal facilities and imminent closures of existing privately-owned, public-use airports. Across the US, privately-owned, public-use airports are subject to development pressures, particularly those facilities best suited to serve as relievers to primary airports.

A key consideration is the local, municipal or state sponsorship of these airports, or their designation as reliever airports, which enables their eligibility for FAA funding. In order for NAWCAD to function effectively as a regional system airport, it must have a public sponsor. However, interviews conducted with local officials indicated that no interest in public sponsorship of NAWCAD exists.

B.3.2 Existing Aviation Demand/Capacity

Table B-1 summarizes the current aviation demand and capacity of local airports in the vicinity of NAWCAD. These airports represent those facilities that could potentially be affected either geographically or in terms of their aviation role, if another public-use airport were constructed at Warminster.

Based on the data in Table B-1, the local general aviation airports show a strong demand for additional facilities for based aircraft in the area. Interviews with fixed base operators and airport managers revealed that many pilots are on waiting lists to either hangar or tie-down their planes. Two regional air carrier facilities, Northeast Philadelphia and Philadelphia International, are currently operating at 79 percent and 77 percent of their annual service volumes, or capacity levels, respectively. Figure B-1 shows the relationship of NAWCAD to these and several other regional airports.

B.3.3 Projected Aviation Demand/Capacity

Table B-2 summarizes the projected aviation demand and capacity of airports in the vicinity of Warminster as forecast by existing studies. Once again, those airports identified are those that could potentially be affected either geographically or in terms of its aviation role in the region.

As shown in Table B-2, Doylestown and Pennridge will reach about 40 percent of their annual service volume in terms of operating capacity by 2020. In fact, Doylestown shows a 123-percent increase in the percentage of total operating ASV being utilized between 1994 and 2020. Overall, the annual service volumes of the selected airports indicate that excess operating capacity exists among these eight airports.

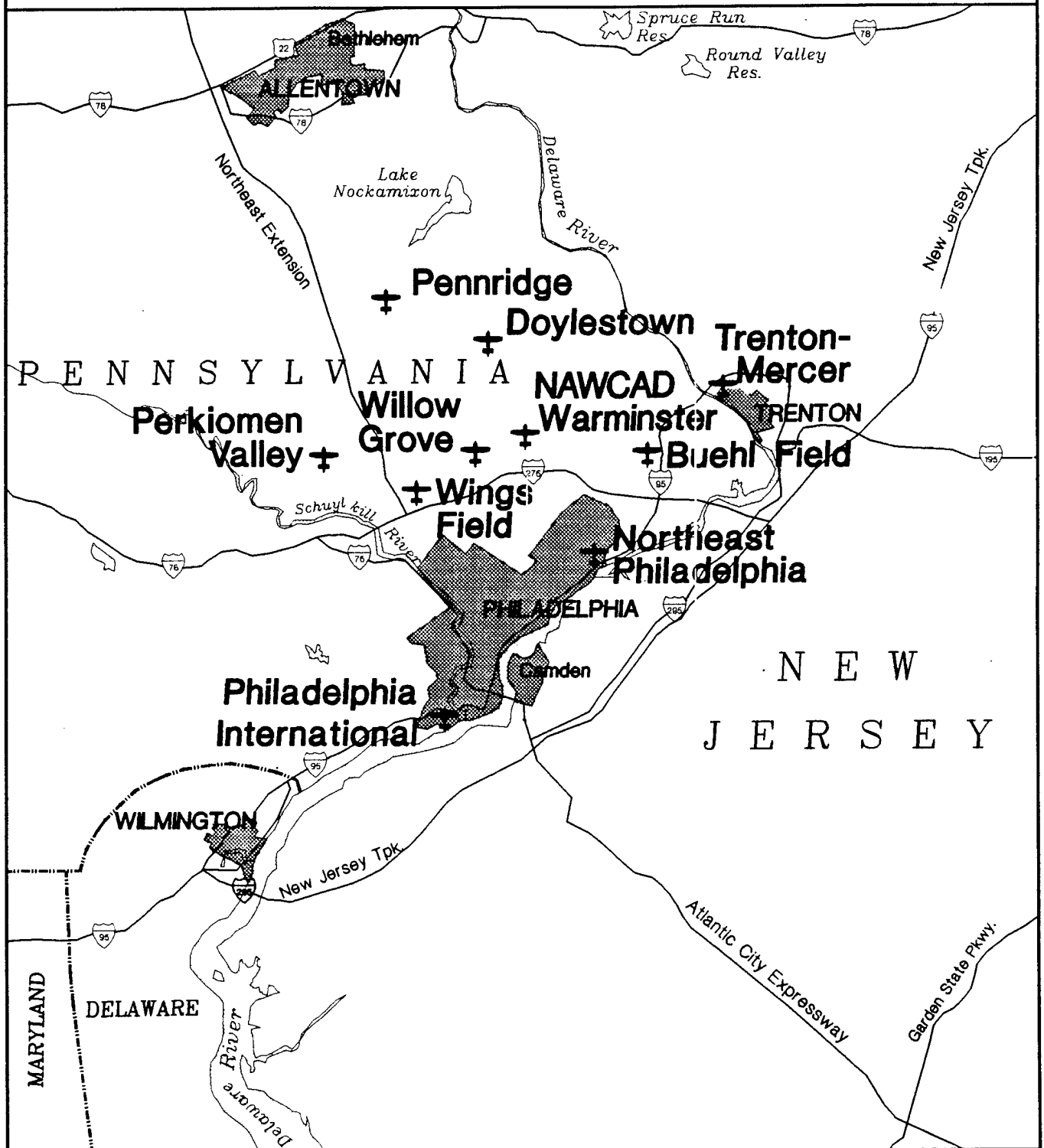
Storage capacity is another significant problem at these airports unless major improvements or additional facilities are developed in the near future. These eight airports are projected to experience a major increase in the number of their based aircraft over the next several years. Pennridge, Buehl Field and Wings Field are airports that are projected to experience the greatest growth in based aircraft in the region, with increases of approximately 55 percent, 39 percent and 38 percent, respectively, between 1994 and 2020. However, the ability of these airports to accommodate this growth will fall far short of meeting the demand for storage space. The significant lack of aircraft

Table B-1

Existing (1994) Aviation Demand/Capacity
Individual/Regional Airports Perspective

Airport	Demand ¹ (operations)		Capacity ²		1994 Current Based Aircraft ¹
	Commercial & Cargo	GA	ASV	% of ASV	
Doylestown	—	41,272	30,000	17.9%	128
Buehl Field	—	6,888	N/A		36
Northeast Philadelphia	—	182,244	30,000	79.2%	218
Philadelphia International	345,000	70,000	480,000	86.5%	50
Trenton-Mercer	4,000	146,101	N/A		158
Wings Field	—	34,336	N/A		94
Perkiomen Valley	—	40,412	N/A		95
Pennridge	—	29,700	94,400	31.5%	55
TOTAL					834
Notes: N/A = Not Available; GA = General Aviation; ASV = Annual Service Volume Sources: ¹ Delaware Valley Regional Planning Commission's RASP, Tables V-6 and V-7; 1994 base year data. ² Airport Master Plans, where available.					

Airports in NAWCAD Region



Airport Location



Urban Area



Interstate Highway



US Highway

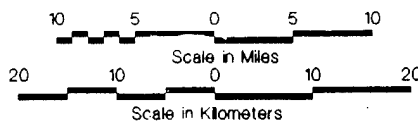


Figure B-1

Table B-2

**Projected (2020) Aviation Demand/Capacity
Individual/Regional Airports Perspective**

Airport	Demand ¹ (operations)		Capacity ²		2020 Projected Based Aircraft ¹
	Commercial & Cargo	GA	ASV	% of ASV	
Doylestown	—	85,000	230,000	40.0%	170
Buehl Field	—	35,000	N/A		50
Northeast Philadelphia	—	200,000	230,000	87.0%	245
Philadelphia International	547,367	80,000	560,000	112.0%	50
Trenton-Mercer	8,452	196,000	N/A		190
Wings Field	—	55,000	N/A		130
Perkiomen Valley	—	45,000	N/A		105
Pennridge	—	40,000	94,400	42.4%	85
TOTAL					1,025
Notes: N/A= Not available; GA = General Aviation; ASV = Annual Service Volume Sources: ¹ Delaware Valley Regional Planning Commission's RASP, Tables V-6 and V-7. ² Airport Master Plan Reports, where available.					

storage space facing the region is such an important factor that the DVRPC has made it the Number 2 goal of its 14 goals and objectives for the 2020 RASP, ahead of projects to increase operating capacity or decrease airspace conflicts.

Table B-3 summarizes existing and projected operations per based aircraft for 2010 and 2020 (based upon DVRPC figures) for each of the regional airports that could be affected by an aviation facility at NAWCAD. Data for Year 2010 are interpolations.

B.3.4 Potential Aviation Role of Warminster

Every airport has a unique and dynamic relationship with every other airport in its *vicinity*. Depending upon the service level and type of aviation activity of a facility, the definition of vicinity can be local or global. For example, air passenger activity at Philadelphia International Airport (PHL) is highly dependent upon the frequency and scheduling of flights, service, and airfares. For the most part, PHL's major competitor within the Philadelphia region for providing domestic air carrier service is Newark International Airport.

In terms of international air passenger service from Philadelphia, alternative airports used by passengers in the Philadelphia region for international travel differ from alternatives used for domestic travel. Similarly, alternative regional airports providing air cargo and general aviation service are different as well. Each type of air transport service offered has a distinct interrelationship with other airports providing similar services. Given the type of operational activity, air passenger, air cargo or general aviation, the interrelationships among airports change.

Air Passenger Service

Forecasts of potential air passenger activities at NAWCAD requires consideration of the feasibility for such services in the region. Air service feasibility must consider the demand for such service and its cost.

Currently, two primary airports provide air carrier passenger service for the North Philadelphia region. These airports are Philadelphia International and Trenton-Mercer Airports. Philadelphia International Airport is located approximately 50 minutes average travel time from NAWCAD and offers frequent, non-stop domestic and international service to many destinations.

Trenton-Mercer also provides commercial air service to destinations such as Baltimore, MD and Washington, D.C., although the service is infrequent and the air access provided to other airports is largely service by smaller commuter aircraft such as the Beech 1900. More recently, this airport has

Table B-3
Existing & Projected Number of Operations
Per Based Aircraft at Area Airports

Airport	1994	2010	2020
Doylestown	322	422	500
Buehl Field	191	425	700
Northeast Philadelphia	836	824	816
Philadelphia International	1,400	1,520	1,600
Trenton-Mercer	925	989	1,032
Wings Field	365	400	423
Perkiomen	425	427	428
Pennridge	540	496	471
Source: Delaware Valley Regional Planning Commission's RASP, based on figures in Tables V-6 and V-7.			

been providing limited commercial scheduled service and charter service on B-737 aircraft flown by Eastwind Airlines to varying destinations. The Trenton-Mercer Airport is located approximately 35 minutes average travel time from NAWCAD.

Due to sufficient air carrier service in the Philadelphia area provided by PHL and Trenton-Mercer, the demand for commercial air carrier commercial passenger service at NAWCAD would be limited and would most likely never occur. Two air carriers were interviewed regarding airline interest in locating at Warminster. Neither airline expressed an interest in offering competitive service at Warminster because of the proximity to Philadelphia International Airport (PHL). While the Philadelphia region generates substantial numbers of origin and destination trips, most passengers use PHL because of its high level of service and frequency of scheduled flights. Based on similar studies conducted of new airports in other US metropolitan areas, it can be assumed that the potential for interest in an airline servicing or investing in a new airport is not likely to occur at Warminster. This assumption is further supported by the following issues and constraints:

- Airspace constraints with other airports, such as Naval Air Station Joint Reserve Basin (NASJRB), Philadelphia International, Northeast Philadelphia and Trenton-Mercer Airports;
- Lack of instrument approach capability at Warminster;
- Lack of public sponsorship;
- Lack of airline interest in investing in Warminster; and
- Limited overall approach capabilities.

The existence of regional commuter service at Trenton-Mercer Airport, which also serves the Warminster area, reduces the probability or need for another commuter facility. Factors to consider for regional airline service are similar to those for air carrier airlines with the exception of the aircraft type used by the regional airline. Often the aircraft used by a regional airline, especially if it is a turboprop aircraft, has a negative impact upon the air traveler. Currently, many regional airlines are upgrading fleets in an effort to phase out the smaller turboprops and convert fleets to mid-size jets. Obviously, in a smaller market, this action would require more enplanements or passengers for the airline to be profitable. Therefore, the lack of support or interest from the airlines and the lack of evidence that such commercial air service would be feasible or profitable supports the likelihood that passenger service would not be warranted for the Warminster site.

Air Cargo/Freight Operations

Air cargo/freight tonnage forecasts may depend on an array of factors that include: tariffs; frequency of service; security, type and value per unit weight; reliability and quality of service; and, most importantly, cost of operation at the airport. The Warminster air cargo forecast assumes a very small share of the PHL market.

Forecasts of scheduled cargo activity into and out of the North Philadelphia area and, in particular, the potential for this activity at NAWCAD was determined on the basis of a study jointly prepared by PENNDOT and the DVRPC in 1994, as well as statements made by several businesses and industries in the general vicinity of the site. The PENNDOT/DVRPC study stated that many of the products produced in the Philadelphia region and shipped by air are trucked to New York airports. Based on these studies and the on-time reliability required of scheduled services, there is little potential for scheduled air cargo services to develop at Warminster.

However, some of those interviewed did express interest in additional cargo services. There may be a potential for occasional, non-scheduled cargo flights to pick up or deliver goods on a limited basis, for example delivery of a machinery part. Therefore, the aviation forecast for Warminster does assume some occasional light air cargo service.

However, the possibility of using an airport at Warminster to ship cargo or freight on a consistent basis is limited by the same constraints described earlier for air passenger service. The existing airspace constraints would eliminate approach and departure tracks and severely constrain operations. Therefore, the probability of using Warminster as a scheduled, commercial cargo/freight facility is extremely unlikely.

General Aviation

A forecast of general aviation activity was prepared for the Warminster site, employing 1994 as the base year, 2000 as the short-term projection and 2010 as the planning horizon. These forecasts were developed for general aviation and for unscheduled, on-demand light air cargo/freight operations. The methodology used to derive the ranges of projected based aircraft and resultant operational forecasts presented below.

A conceptual analysis was conducted using the following assumptions and guidelines:

- A 30-minute average drive time delineates a typical service area for a general aviation airport (also used by the DVRPC). This 30-minute drive time is an industry accepted standard used for planning purposes. The number of aircraft registered to owners within a radius of 30 minutes from the Warminster site was identified by zip code using the US aircraft registry database published by Aircraft Technical Publishers (ATP). It was assumed that 100 percent of these registered general aviation (GA) aircraft owners could choose to base their aircraft at a GA airport in Warminster, if competitive service was provided by the fixed base operator (FBO).
- Previous studies of Delaware Valley regional airports and interviews with local sponsors resulted in identifying several local airports that may close in the next several years. Two of these facilities, Buehl Field and Wings Field, are located approximately 10 miles (16 kilometers) east and west, respectively, of the Warminster site. It was

assumed that as many as half of the registered owners of non-corporate aircraft (single and multi-engine piston) located within the service areas of these two airports would relocate to an aviation facility at the Warminster site.

- Half of the aircraft owners waiting to base at nearby Doylestown and Northeast Philadelphia Airports may decide to relocate their aircraft to Warminster because of proximity to homes or business or due to potentially lower hangar/service costs.
- The prospective market area for NAWCAD overlaps each of the four closest existing facilities' market areas. Since approximately 40 percent of all registered aircraft owners located in zip codes of nearby airports actually base their aircraft at airports located nearest to them, it was assumed that a similar percentage could be applied to Warminster. The 40 percent of all registered aircraft based at an airport is a reasonable expectation based on experience of ratios at similar-sized airports in other parts of the United States.

Table B-4 identifies the number of aircraft that could potentially operate out of NAWCAD. Although this table represents the total number of aircraft estimated to be located in the general vicinity of the site, not all aircraft would be candidates for basing at Warminster, such as turbojets, turboprops and owners of recreational aircraft that prefer to operate their aircraft in uncongested areas.

Table B-5 presents a range of forecast based aircraft. These forecasts were prepared to reflect a wide range of probable activity from the worst case (low) to the most likely case (mid) to the best scenario (high). Assumptions for forecast ranges are as follows:

- High: Equal to 100 percent of all registered aircraft owners in zip codes within a 30-minute average travel time from the site. This figure includes all aircraft registered to owners hangaring their aircraft at an aviation facility, those hangaring their aircraft on their own property, those who may have yet to build a kit aircraft or those who are storing a non-operative aircraft.
- Mid: Equal to 40 percent of the registered aircraft. This is the average percentage of the registered aircraft within the market areas of two nearby airports (Doylestown and Wings Field) that are actually based at these airports.
- Low: Equal to 24 percent of the registered aircraft. This is similar to the average percentage of the registered aircraft within the market area of Buehl Field actually based there.

Table B-4

**1994 Baseline Inventory For Potentially Based Aircraft
at NAWCAD Airport Site**

Aircraft Type (1)	No. of Aircraft Within 30 Minutes	No. of Aircraft from Airports Projected to Close (2)	No. of Aircraft from Nearby Airports (3)	Total Potential Based Aircraft
Single-Engine Piston	165	134	58	357
Multi-Engine Piston	10	14	6	30
Turboprop	4	—	2	6
Turbojet	1	—	1	2
Other (4)	24	24	18	66
TOTAL	204	172	85	461
<p>Notes: 1. The typical aircraft in these categories are: Single-Engine Piston, Cessna 177; Multi-Engine Piston, Beech Baron 58P; Turboprop, Cessna Conquest 441; Turbojet, Lear 35; and Other, a mixture of light powered and unpowered airplanes.</p> <p>2. This figure is based on 50% of the potential based aircraft (single engine piston, multi-engine piston, and other only) within the combined market areas of Buehl Field and Wings Field.</p> <p>3. This figure is based on 50% of based aircraft on the combined waiting lists at Doylestown and Northeast Philadelphia Airports. It is also assumed that those aircraft on the waiting list would be approximately the same fleet mixture of aircraft types that are currently based at each airport.</p> <p>4. Includes ultralights, gliders, helicopters, etc.</p>				

Table B-5

**Range of Forecast Based Aircraft in 2000 and 2010
at NAWCAD Airport Site**

Aircraft Type	2000			2010		
	High	Mid	Low	High	Mid	Low
Single-Engine	357	143	86	391	156	94
Multi-Engine	30	12	7	33	13	8
Turboprop	6	0	0	7	0	0
TOTALS	393	155	93	431	169	102

For modeling purposes, the mid-range forecasts are recommended. It should be noted that two important assumptions also have been made about the typical operation at the facility which affect forecasts. These are:

- The airport will not have instrument capability, therefore no turboprop or turbojet aircraft are anticipated to base at Warminster (although some activity by turboprop aircraft only is anticipated) -- corporate aircraft operate under extremely stringent insurance requirements and will usually not operate at an airport without instrument approach capability; and
- No training or recreational flying would be permitted due to airspace constraints. This means that no aircraft from the "other" category (helicopters, gliders, ultralights) will base at the facility.

Table B-6 summarizes forecast activity ranges of operations for Year 2000 and Table B-7 provides forecasts for Year 2010. A range of operations per based aircraft were assumed and are held constant for both forecast periods. These figures are 500, 275 and 200 operations per based aircraft for airports with a medium level of business activity, those with a low level of business activity and those with an occasional use by other operators of aircraft, respectively.

This range of operations per based aircraft is based not only upon an analysis of Table B-3 presented earlier, but is also based upon the envisioned usage of an aviation facility at NAWCAD and the constraints that would be inherent with it. In general, higher levels of activity are associated with airports that attract greater numbers of operations by aircraft that are not based at the airport. This assumes Warminster would attract some non-local light air cargo and business users, but that much of the activity would be generated by owners of based aircraft.

Peak hour operations at non-towered airports are difficult to estimate. Three of the four airports closest to NAWCAD (Northeast Philadelphia Airport excluded) are non-towered. Accordingly, research from other areas of the U.S. regarding typical peak hour operations at non-towered airports in metropolitan areas were used. Peak hour estimates were prepared based upon intensive research completed by the INDOT-Division of Aeronautics. Several factors borne out of this research, peak month and peak hour percentages, were used in this process of determining peak hour operational levels for non-towered airports. Table B-8 presents the peak hour operational levels for the two forecast periods.

Table B-6

Year 2000 Forecast General Aviation and Cargo Operations
at NAWCAD

AC Type	Medium Business Use			Low Business Use			Occasional Use		
	Total	Day	Night	Total	Day	Night	Total	Day	Night
SEP	178,500	176,700	1,800	39,300	38,900	400	17,200	17,050	150
MEP	15,000	14,800	200	2,900	2,850	50	1,300	1,300	0
TP	3,000	2,400	600	400	300	100	100	100	0
TOT	196,500	193,900	2,600	42,600	42,050	550	18,600	18,450	150
Note: All figures rounded to nearest 50 for noise estimation purposes.									

Table B-7

Year 2010 Forecast General Aviation and Cargo Operations
at NAWCAD Airport Site

AC Type	Medium Business Use			Low Business Use			Occasional Use		
	Total	Day	Night	Total	Day	Night	Total	Day	Night
SEP	195,500	193,500	2,000	42,900	42,450	450	18,800	18,600	200
MEP	16,500	16,300	200	3,000	2,950	50	1,400	1,400	0
TP	3,500	2,800	700	600	500	100	200	150	50
TOT	215,500	212,600	2,900	46,500	45,900	600	20,400	20,150	250
Note: All figures rounded to nearest 50 for noise estimation purposes.									

Table B-8

Peak Hour Operational Levels at a Non-Towered Airport
for Forecast Years 2000 and 2010

Forecast Year	Forecast Scenario		
	High	Mid	Low
2000	55	12	5
2010	60	13	6

B.4 Airspace Considerations

Several reports regarding airspace interactions in the North Philadelphia and greater Philadelphia area were prepared recently for the Delaware Valley Regional Planning Commission (DVRPC) by Samis & Hamilton. Interviews were conducted with managers of two nearby air traffic control towers to verify information contained within these reports.

The conclusion from the interviews and reports is that there is a good likelihood for airspace conflict during all-weather/IFR (Instrument Flight Rules) conditions with the Northeast Philadelphia and Trenton-Mercer Airports if NAWCAD had any type of instrument approach. There are two major reasons for this conclusion. The first is that a portion (holding pattern) of the IFR-reserved airspace for the two existing airports' instrument approaches overlap. To introduce a third airport into this airspace with an additional instrument approach would mean more aircraft in this area.

The second reason is that NASJRB Willow Grove is located approximately four miles (six kilometers) west of NAWCAD. This area has major VFR (Visual Flight Rules) activity which would limit any consideration of an instrument runway to Runway 27, i.e., easterly approaches and departures only. Reports and interviews verified that concerns exist now regarding VFR aircraft entering Willow Grove's Class D airspace. Research also indicates that airspace conflicts and the complexity of integrating operations at NAWCAD could lead to traffic delays at NASJRB Willow Grove, particularly during IFR operations.

For these reasons, only a visual approach is potentially feasible at NAWCAD.

B.5 Findings

The results include a potential aviation demand and capacity shortfall in the vicinity of NAWCAD. However, airfield constraints, potential airspace conflicts with existing approach and departure procedures, and minimal public support would limit the use of the site to a Basic Utility (B-I) general aviation airport.

This class airport can accommodate light (less than 12,500 pounds gross weight) single-engine and multi-engine piston aircraft. For planning purposes, the typical aircraft served by Basic Utility airport include the Cessna 177, Beech Baron 58 and the Cessna 414. The Cessna 414 is the largest aircraft anticipated to use the airport on a frequent basis, however. This aircraft falls within the FAA's Airplane Design Group B-I, which is this facility's critical aircraft. An airport's critical aircraft is used as the planning parameter for establishing airport design. Runway criteria associated with this type of aircraft is 3,800 feet (1,100 meters) in length and 60 feet (18 meters) in width.

Such an airport would be a VFR-only facility serving minimal on-demand air cargo aviation and general aviation activities. No commercial service passenger or scheduled air cargo operations would be feasible due to the complex and congested airspace system surrounding Philadelphia International Airport and NASJRB Willow Grove.

While an aviation demand forecast can be justified, several drawbacks were identified. The airspace around Warminster is a significant issue for consideration. There are overlapping approaches between Northeast Philadelphia and Trenton-Mercer Airports. The site falls within the Class D airspace of NAS Willow Grove to the west. The entire area falls within the extended airspace of Philadelphia International Airport which requires the use of a transponder, a device in an aircraft that indicates the aircraft's location and its direction of movement on a radar screen as a "blip." With the potential for airspace conflicts, aviation activity at Warminster would be limited to operations on one runway end. Both civil and military air traffic controllers believe that this site would adversely impact approach and departure procedures at existing airports.

Airspace and facility constraints would also limit general aviation and light air cargo activity to operations by small piston-type aircraft. Given the operational limitations and potential airspace conflicts, owners of this aircraft type may choose to avoid Warminster. No sensitivity analysis was performed regarding the willingness of such aircraft owners to operate under these conditions though it is reasonable to assume that some would not. Therefore, the low business use aviation activity forecast presented herein is the best case for potential aviation activity and the worst case for noise modeling.

Another significant drawback is the minimal level of municipal interest in sponsoring the Warminster site. Given the fact that many municipal airports are subsidized by local communities and this potential airport has some potential airspace constraints, it is unlikely that interest in sponsorship of

this facility would increase after further review. It is a finding of this analysis that strong local sponsorship is a prerequisite for an aviation facility at NAWCAD.

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Turner Collie & Braden, Inc. February 1993. Philadelphia International Airport Layout Plan Update.

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ATTACHMENTS

Interview Form for Commercial/Industrial Firms

1. Name of firm _____
2. Firm's function _____
3. Contact person _____ Title _____
4. Telephone number _____ Fax number _____
5. Address _____

6. How many people employed by your firm live in the North Philadelphia area? _____
7. What is the total payroll of these individuals? _____
8. On average, how often do your employees travel by air: _____ 1-2 times per year?
_____ 3-5 times per year?
_____ 6-10 times per year?
_____ times per year?
9. When these employees travel by commercial carrier, what airports in the Philadelphia area do fly out on a regular basis? _____, _____,
_____, _____, _____

Approximate the percent split between multiple airports _____, _____, _____
10. Does your firm own/operate an aircraft for corporate use? Yes No
If yes, how many? _____ Where is (are) it (they) based? _____
How (are) they used? _____

How often do employees fly in this (these) aircraft? _____ 1-2 times per year?
_____ 3-5 times per year?
_____ 6-10 times per year?
_____ times per year?
11. How many tons of cargo and overnight packages are shipped approximately last year by your firm? _____ cargo _____ overnight pkgs.

12. What percent of this shipments were carried by: ___ your own aircraft?
 ___ scheduled commercial airlines?
 ___ integrated carriers (FedEx, UPS)?
 ___ chartered/FBO aircraft?
13. Of the tonnage sent by means other than air (truck, rail, etc.), how much would your firm shift to shipment by air if an airport capable of handling such goods was situated less than 30 miles from your place of operations? _____
14. If a new passenger/cargo facility were built at the NAWCAD-Warminster site in the next 5 years, would your firm use it if it were adequately sized and retrofitted to handle the region's demand? Yes No
If yes, how often would you use it: ___ 1-2 times per month?
 ___ 3-5 times per month?
 ___ 6-10 times per month?
 ___ _____ times per month?
15. Would your firm be one possibly interested in the investment strategies associated with such an undertaking (particularly knowing the positive effect of Public Benefit Transfers and conveyances)? Yes No
If yes, to what extent? _____
If no, what would prevent your firm from doing so? _____

16. In what ways would a public-use aviation facility located at NAWCAD-Warminster be conducive to the development of the north Philadelphia area? _____

17. In your mind, what would the maximum outlay the area's communities could bear for such a facility to help meet the unmet air commercial/cargo/general aviation needs?

 ___ \$0-500,000?
 ___ \$500,000-1,000,000?
 ___ \$1,000,000-5,000,000?
 ___ \$5,000,000 and greater?

Interview Form for Governmental Agencies

1. Name of agency _____
2. Agency's function _____
3. Contact person _____ Title _____
4. Telephone number _____ Fax number _____
5. Address _____

6. Based upon your understanding, is the *commercial passenger demand* being met adequately in the region today? Y N
Will it be adequately met in the Year 2010? Y N In the Year 2020? Y N
why/why not? _____
7. Based upon your understanding, is the *air cargo demand* being met adequately in the region today? Y N
Will it be adequately met in the Year 2010? Y N In the Year 2020? Y N
why/ why not? _____
8. Based upon your understanding, is the *general aviation demand* being met adequately in the region today? Y N
Will it be adequately met in the Year 2010? Y N In the Year 2020? Y N
why/why not? _____
9. If the demand was such that a commercial passenger/cargo/general aviation facility was warranted at the NADC-Warminster site, what would this mean for the capacity of the region from your perspective? Would it be a welcome addition? Would it serve to limit capacity? Would it serve only a few at the expense of many? Would it _____?
Why? _____
10. A recent study published by the DVRPC indicates that because of the Delaware Valley region's complex airspace, the introduction of new aviation facilities would further complicate

11. How would you rate the instrument capabilities/radar coverage in the general vicinity of the NADC-Warminster facility: Excellent? _____

12. If a commercial passenger/cargo/general aviation facility were located at the NADC-Warminster site and IFR airspace was reserved for this type of activity, to what extent would low-level arrivals and departures at surrounding airports be affected? _____

Why?

14. A statement was made in this same DVRPC study that “a major increase in IFR operations at any satellite airport could affect traffic at PHL.” Could the same be said of operations at an aviation facility located at NADC-Warminster? Y N Why? _____

15. Could the statement made in this same DVRPC study that “an initiative to build a private use civilian facility... near Willow Grove, (is) a proposal which the control tower feels would lead to airspace conflicts.” be made of a facility at the NADC-Warminster site? Y N Why or why not?

16. It has been estimated that by the Year 2000, 12 of the region's airports will close and thereby cut the region's aviation capacity in half. Would an aviation facility at NADC-Warminster help alleviate these anticipated losses in your opinion? Y N Why or why not? _____

17. If the runway, nav aids and other support network at an aviation facility at NADC-Warminster were found to be sufficient to accommodate sufficient all-weather capacity in the region,

would this be a good option? Y N Why or why not?

18. Several airspace studies conducted for the DVRPC recently indicated that there are several locations within the regional airspace where congestion acts as a system design constraint. Would an aviation facility at the NADC-Warminster site be part of the solution or a part of the problem? _____ Why? _____

19. The DVRPC says that the 25 regional airports have excess operating capacity. Is this true in your opinion? Y N Why?

Interview Form for Airport Users/FBOs

1. Name of firm _____
2. Firm's function _____
3. Contact person _____ Title _____
4. Telephone number _____ Fax number _____
5. Address _____

6. Based upon your understanding, is the *commercial passenger demand* being met adequately in the region today? Y N

Will it be adequately met in the Year 2010? Y N In the Year 2020? Y N
why/why not? _____
7. Based upon your understanding, is the *air cargo demand* being met adequately in the region today? Y N

Will it be adequately met in the Year 2010? Y N In the Year 2020? Y N
why/why not? _____
8. Based upon your understanding, is the *general aviation demand* being met adequately in the region today? Y N

Will it be adequately met in the Year 2010? Y N In the Year 2020? Y N
why/why not? _____
9. If the demand was such that a commercial passenger/cargo/general aviation facility was warranted at the NADC-Warminster site, what would this mean for the capacity of the region from your perspective? Would it be a welcome addition? Would it serve to limit capacity? Would it serve only a few at the expense of many? Would it _____?
Why? _____

10. A recent study published by the DVRPC indicates that because of the Delaware Valley region's complex airspace, the introduction of new aviation facilities would further complicate the existing airspace interactions and therefore reduce overall system efficiency and safety. Is this your opinion as well? Y N If yes, why?

If no, why? _____

APPENDIX C
CORRESPONDENCE

RECORD OF NON-APPLICABILITY
DISPOSAL AND REUSE OF THE
NAVAL AIR WARFARE CENTER
AIRCRAFT DIVISION
WARMINSTER, PENNSYLVANIA

In accordance with the 1991 and 1995 decisions of the Base Closure and Realignment Commission, acting under the provisions of the 1990 Base Closure and Realignment Act, the Naval Air Warfare Center, Aircraft Division, Warminster (NAWCAD) will be closed. The proposed action is the disposal and reuse of the NAWCAD pursuant to the Reuse Plan for the Naval Air Warfare Center, Bucks County, Pennsylvania prepared for the Economic Adjustment Committee and Base Reuse Subcommittee of Bucks County (March 1995).

In accordance with 40 CFR 51.853,

- (1) Transfers of ownership, interests, and titles in land, facilities, and real and personal properties, regardless of the form or method of transfer; and
- (2) actions (or portions thereof) associated with transfers of land, facilities, title, and real properties through an enforceable contract or lease agreement where the delivery of the deed is required to occur promptly after a specific reasonable condition is met and where the Federal agency does not retain continuing authority to control emissions with the lands, facilities, title, or real properties are clearly *de minimis* with regard to the General Conformity Rule of the Clean Air Act.

Accordingly, it is my determination that the proposed action conforms to the applicable State Implementation Plan (SIP) and is exempt from the conformity requirements of the Clean Air Act General Conformity Rule.

4 Sep 96

Date

F. G. Trummer
F. G. Trummer
Commander, CEC, U.S. Navy
Public Works Officer
By direction of the
Commanding Officer



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Suite 322
315 South Allen Street
State College, Pennsylvania 16801

September 14, 1995

Mr. Gerri O'Brien
TAMS Consultants, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003

Dear Mr. O'Brien:

This responds to your letter of August 17, 1995 requesting information about federally listed and proposed endangered and threatened species within the area affected by the proposed disposal and reuse of the Naval Air Warfare Center located in Bucks County, Pennsylvania. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) to ensure the protection of endangered and threatened species.

Except for occasional transient species, no federally listed or proposed threatened or endangered species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further Section 7 consultation under the Endangered Species Act is required with the Fish and Wildlife Service. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered. A compilation of federally listed species in Pennsylvania is enclosed for your information.

This response relates only to endangered or threatened species under our jurisdiction based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as addressing other Service concerns under the Fish and Wildlife Coordination Act or other legislation.

Requests for information regarding State-listed endangered or threatened species should be directed to the Pennsylvania Game Commission (birds and mammals), the Pennsylvania Fish and Boat Commission (fish, reptiles, and amphibians), and the Pennsylvania Department of Conservation and Natural Resources (plants).

Please contact Carole Copeyon of my staff at 814-234-4090 if you have any questions or require further assistance regarding endangered, threatened, or candidate species.

Sincerely,

Charles J. Kulp
Supervisor

Enclosure

FEDERALLY LISTED SPECIES IN PENNSYLVANIA

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>STATUS*</u>	<u>DISTRIBUTION</u>
<u>FISHES</u>			
Shortnose sturgeon**	<i>Acipenser brevirostrum</i>	E	Delaware River and other Atlantic coastal waters
<u>REPTILES & AMPHIBIANS</u>			
None			
<u>BIRDS</u>			
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Entire state. Recent nesting in Butler, Crawford, Dauphin, Forest, Lancaster, Pike, Tioga, Warren and York Counties
Peregrine falcon (American)	<i>Falco peregrinus anatum</i>	E	Entire state. Recent nesting in and around Philadelphia and Pittsburgh (Allegheny, Delaware, Philadelphia and Bucks Counties)
Piping plover	<i>Charadrius melodus</i>	E	Presque Isle (Erie County). Migratory. No nesting in Pennsylvania since mid-1950s
<u>MAMMALS</u>			
Indiana bat	<i>Myotis sodalis</i>	E	Summer range: possibly state-wide in suitable habitat. Only one known winter hibernaculum (south-central Pennsylvania)
<u>MOLLUSKS</u>			
Clubshell mussel	<i>Pleurobema clava</i>	E	French Creek and Allegheny River watersheds; Clarion, Crawford, Erie, Forest, Mercer and Venango Counties
Northern riffleshell	<i>Epioblasma torulosa rangiana</i>	E	French Creek and Allegheny River watersheds; Crawford, Erie, Forest, Venango and Warren Counties
<u>PLANTS</u>			
Northeastern bulrush	<i>Scirpus ancistrochaetus</i>	E	Current - Blair, Centre, Clinton, Cumberland, Dauphin, Franklin, Huntingdon, Lackawanna, Lehigh, Monroe, Perry and Union Counties. Historic - Northampton County
Small-whorled pogonia	<i>Isotria medeoloides</i>	T	Current - Centre and Venango Counties. Historic - Berks, Chester, Greene, Monroe, Montgomery, Philadelphia Counties

* E = Endangered, T = Threatened

Revised 7/13/95

** Shortnose sturgeon is under the jurisdiction of the National Marine Fisheries Service



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Suite 322
315 South Allen Street
State College, Pennsylvania 16801-4850

November 21, 1995

Commanding Officer, Northern Division
Naval Facilities Engineering Command
Attention: Kurt Frederick, Code 202
10 Industrial Highway
Lester, PA 19113

Dear Mr. Frederick

This responds to the Notice of Intent published in the Federal Register (Vol. 60, No. 185, dated September 19, 1995) to prepare an environmental impact statement for proposed disposal and reuse of the Naval Air Warfare Center Aircraft Division, Bucks County, Warminster, Pennsylvania. These comments provide technical assistance only and do not represent the review comments of the Department of the Interior on any forthcoming environmental statement.

We recommend that all fish and wildlife habitats be identified and mapped early in the process. Alternatives proposed for disposal and reuse should be selected based upon their ability to avoid or minimize adverse impacts to these resources. Compensation for unavoidable adverse impacts to terrestrial and aquatic resources should be addressed through the mitigation process.

Based upon a soil survey map review, hydric soils are found in this area. We believe that wetlands may occur in the undeveloped project area. However, this should be confirmed by a survey done by someone familiar with the 1987 Corps of Engineers Wetland Delineation Manual. If wetlands exist on this site and development would be planned in the wetland, federal and/or state permits would be required.

Endangered Species

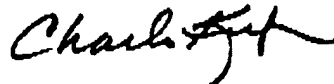
An initial review of the proposed project study area shows that except for occasional transient species, no federally listed or proposed threatened or endangered species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further Section 7 consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) is required with the U.S. Fish and Wildlife Service. Should the project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered. A compilation of federally listed endangered and threatened species in Pennsylvania is enclosed for your information.

This response relates only to endangered or threatened species under our jurisdiction based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as

addressing other Service or Departmental concerns under the Fish and Wildlife Coordination Act or other legislation.

Thank you for the opportunity to comment at this early stage of planning. If you have any questions about our comments, please direct them to Bonnie Stump of my staff.

Sincerely,



Charles J. Kulp
Supervisor

Enclosure

FEDERALLY LISTED SPECIES IN PENNSYLVANIA

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>STATUS</u>	<u>DISTRIBUTION</u>
<u>FISHES</u>			
Shortnose sturgeon**	<i>Acipenser brevirostrum</i>	E	Delaware River and other Atlantic coastal waters
<u>REPTILES & AMPHIBIANS</u>			
None			
<u>BIRDS</u>			
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Entire state. Recent nesting in Butler, Crawford, Dauphin, Forest, Lancaster, Pike, Tioga, Warren and York Counties
Peregrine falcon (American)	<i>Falco peregrinus anatum</i>	E	Entire state. Recent nesting in and around Philadelphia and Pittsburgh (Allegheny, Delaware, Philadelphia and Bucks Counties)
Piping plover	<i>Charadrius melodus</i>	E	Presque Isle (Erie County). Migratory. No nesting in Pennsylvania since mid-1950s
<u>MAMMALS</u>			
Indiana bat	<i>Myotis sodalis</i>	E	Summer range: possibly state-wide in suitable habitat. Only one known winter hibernaculum (south-central Pennsylvania)
<u>MOLLUSKS</u>			
Clubshell mussel	<i>Pleurobema clava</i>	E	French Creek and Allegheny River watersheds; Clarion, Crawford, Erie, Forest, Mercer and Venango Counties
Northern riffleshell	<i>Epiplatysma torulosa rangiana</i>	E	French Creek and Allegheny River watersheds; Crawford, Erie, Forest, Venango and Warren Counties
<u>PLANTS</u>			
Northeastern bulrush	<i>Scirpus anclastrochaetus</i>	E	Current - Blair, Centre, Clinton, Cumberland, Dauphin, Franklin, Huntingdon, Lackawanna, Lehigh, Monroe, Perry and Union Counties. Historic - Northampton County
Small-whorled pogonia	<i>Isotria medeoloides</i>	T	Current - Centre and Venango Counties. Historic - Berks, Chester, Greene, Monroe, Montgomery, Philadelphia Counties

* E = Endangered, T = Threatened

Revised 7/13/88

** Shortnose sturgeon is under the jurisdiction of the National Marine Fisheries Service

U.S. FISH AND WILDLIFE SERVICE
315 SOUTH ALLEN ST., SUITE 322, STATE COLLEGE, PA 16801

FEDERALLY LISTED SPECIES IN PENNSYLVANIA

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>STATUS</u>	<u>DISTRIBUTION</u>
<u>FISHES</u>			
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<u>REPTILES & AMPHIBIANS</u>			
None			
<u>BIRDS</u>			
Bald eagle	<i>Haliaeetus leucocapillus</i>	T	Entire state. Recent nesting in Butler, Crawford, Dauphin, Forest, Lancaster, Pike, Tioga, Warren and York Counties
Peregrine falcon (American)	<i>Falco peregrinus anatum</i>	E	Entire state. Recent nesting in and around Philadelphia and Pittsburgh (Allegheny, Delaware, Philadelphia and Bucks Counties)
Piping plover	<i>Charadrius melodus</i>	E	Prairie Isle (Erie County). Migratory. No nesting in Pennsylvania since mid-1950s
<u>MAMMALS</u>			
Indiana bat	<i>Myotis sodalis</i>	E	Summer range: possibly state-wide in suitable habitat. Only one known winter hibernaculum (south-central Pennsylvania)
<u>MOLLUSKS</u>			
Clubshell mussel	<i>Pleurobema clava</i>	E	French Creek and Allegheny River watersheds; Clarion, Crawford, Erie, Forest, Mercer and Venango Counties
Northern riffleshell	<i>Epioblasma torulosa renigera</i>	E	French Creek and Allegheny River watersheds; Crawford, Erie, Forest, Venango and Warren Counties
<u>PLANTS</u>			
Northeastern bulrush	<i>Scirpus encistrocheatus</i>	E	Current - Blair, Centre, Clinton, Cumberland, Dauphin, Franklin, Huntingdon, Lackawanna, Lehigh, Monroe, Perry and Union Counties. Historic - Northampton County
Small-whorled pogonia	<i>Isotria medeoloides</i>	T	Current - Centre and Venango Counties. Historic - Berks, Chester, Greene, Monroe, Montgomery, Philadelphia Counties

E = Endangered, T = Threatened

Revised 7/13/95

** Shortnose sturgeon is under the jurisdiction of the National Marine Fisheries Service

U.S. FISH AND WILDLIFE SERVICE
315 SOUTH ALLEN ST., SUITE 322, STATE COLLEGE, PA 16801


PENNSYLVANIA NATURAL DIVERSITY INVENTORY REVIEW RESPONSE

REQUESTER: Gerrie O'Brien
TAMS Consultants, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003

PROJECT: Naval Air Warfare Center Reuse

QUADRANGLE: *Hatboro*

In response to your request of August 17, 1995 an area was reviewed for the presence of natural resources of special concern using the Pennsylvania Natural Diversity Inventory (PNDI) information system. We do not anticipate any impact on rare, threatened or endangered species at this location.


Chris Klinedinst Firestone, PNDI Staff

9-22-95
Date

PNDI is a site specific information system which describes significant natural resources of Pennsylvania. This system includes data descriptive of plant and animal species of special concern, exemplary natural communities and unique geological features. PNDI is a cooperative project of the Department of Conservation and Natural Resources, The Nature Conservancy and the Western Pennsylvania Conservancy. This response represents the most up-to-date summary of the PNDI data files. However, an absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. PNDI is partially funded through contributions to the Wild Resource Conservation Fund.

Be advised that legal authority for Pennsylvania's biological resources resides with three administrative agencies. The enclosure titled PNDI Management Agencies, outlines which species groups are managed by these agencies. If you have questions concerning this response or the PNDI system, please contact our office at 717/787-3444 or write:

DCNR - Bureau of Forestry - PNDI
P.O. Box 8552
Harrisburg, PA 17105-8552

APPENDIX D
RESULTS OF NOISE MONITORING SURVEY

Table D-1
Site 1: 1430 Second Street Between Street Road and Bristol Road

	L_{eq}	L_{90}	L_{50}	L_{10}	L_1
AM Peak	65	55	64	68	74
Midday	64	53	61	68	72
PM Peak	65	55	62	68	73
Pre Mid	61	50	59	63	70

Table D-2
Site 2: 440 Bristol Road Between Whitney Road and Second Street

	L_{eq}	L_{90}	L_{50}	L_{10}	L_1
AM Peak	65	54	64	68	74
Midday	63	53	62	66	72
PM Peak	64	54	63	67	73
Pre Mid	60	49	58	63	69

Table D-3
Site 3: 236 Bristol Road Between Hatboro Road and Jacksonville Road

	L_{eq}	L_{90}	L_{50}	L_{10}	L_1
AM Peak	64	53	63	67	73
Midday	63	52	62	66	74
PM Peak	65	54	63	68	75
Pre Mid	62	50	60	64	71

Table D-4
Site 4: 1230 Jacksonville Road Between Bristol Road and Street Road

	L_{eq}	L_{90}	L_{50}	L_{10}	L_1
AM Peak	64	54	63	67	75
Midday	63	52	62	66	73
PM Peak	65	54	64	68	76
Pre Mid	63	50	60	66	73

Table D-5
Site 5: 375 Street Road Between Newton Road and Centennial Road

	L_{eq}	L_{90}	L_{50}	L_{10}	L_1
AM Peak	66	56	65	69	77
Midday	64	52	62	67	75
PM Peak	67	55	65	70	79
Pre Mid	64	62	63	68	76

Table D-6
Site 6: Intersection of Lowell Road and Street Road

	L_{eq}	L_{90}	L_{50}	L_{10}	L_1
AM Peak	65	55	64	68	76
Midday	63	53	62	66	74
PM Peak	65	65	64	69	77
Pre Mid	63	51	60	65	74

APPENDIX E

AIRCRAFT NOISE ANALYSIS ASSUMPTIONS

E.1 Aircraft Noise Analysis Assumptions

An assumption was made that operations at night (those operations occurring between 10:00 pm and 7:00 am) would be limited assuming the following percentages of total activity occurring at night:

- single-engine piston, 1 percent;
- multi-engine piston, 1.5 percent; and
- turboprop (including cargo), 20 percent.

It is assumed all turboprop activity is non-local since there are no forecast based turboprops. In addition, turboprop activity is assumed to be comprised almost entirely of on-demand cargo operations (90 percent cargo and 10 percent general aviation itinerant). All operational figures have been rounded to the nearest 50 for noise estimation purposes.

The FAA preferred computer model, Integrated Noise Model (INM, version 5.0), was utilized to predict the noise impact from the forecasted mid-range aircraft operations. INM was developed by the Federal Aviation Administration (FAA) as a planning tool for determining approximate aircraft noise levels at and around airport. The model incorporates a database of known sound levels from various aircraft and uses mathematical processes which consider the degradation of sound energy over distance.

The model requires inputs such as:

- annual average daily operational characteristics at airport, including the type of aircraft and the number of aircraft operations;
- runway(s) layout and its utilization rates;
- flight track(s) configuration and its usage.

The model output comes in the form of noise contour plots, graphs, and tabular information regarding the noise levels at specific receptor locations.

Flight track usage (Table E-1) and airport site-specific parameters (Table E-2) were incorporated in the modeling.

Table E-1

Assignment of Aircraft Operations By Type To Arrival & Departure Flight Tracks

Track No.	Aircraft % Usage
A1	SEP = 20%
	MEP = 40%
	TUR = 70%
A2	SEP = 40%
	MEP = 40%
	TUR = 20%
A3	SEP = 40%
	MEP = 20%
	TUR = 10%
Totals	SEP = 100%
	MEP = 100%
	TUR = 100%
D1	SEP = 30%
	MEP = 25%
	TUR = 40%
D2	SEP = 30%
	MEP = 25%
	TUR = 20%
D3	SEP = 20%
	MEP = 25%
	TUR = 20%
D4	SEP = 20%
	MEP = 25%
	TUR = 20%
Totals	SEP = 100%
	MEP = 100%
	TUR = 100%

Table E-2
NAWCAD Site Information

Information Needed	Finding
Temperature	53 Fahrenheit
Latitude	40.1981 N
Longitude	75.0754 W
Elevation	375 MSL
Average Headwinds	9.6 knots
Change in Average Headwinds	none
Displaced Thresholds	none
Glide Slope	3.5 degrees
Threshold Crossing Height	75 feet
Atmospheric Pressure	29.66

